

# The BIG Project

*Creating, Provisioning, Deploying, and Managing*  
.NET Services

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# BIG Mission

Define a software architecture for *creating, provisioning, deploying* and *managing* Internet-scale .NET services.

- Target Services with:
  - Millions to 100's of Millions of Users
  - 1000's to 100s of 1000s of simultaneous Users
  - 100s to 100s of 1000s of Machines.

# BIG Mission

Define a software architecture for *creating, provisioning, deploying and managing* Internet-scale .NET services.

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  - 100s to 100s of 1000s of Machines.



# Cluster Management Starts with The Node

- Simple single-node management is crucial.
  - Completely hands-off, remote administration.
  - All administration through IP protocols.
  - Bare machine → running system image.
    - Fast as possible (support fast-fail, fast-recovery model).
- ***BMonitor***: Single-node building block.
  - Fits in 64KB of FLASH.
  - Supports IP,UDP,DHCP,TFTP, & BMCP.
  - Filters all network traffic.
  - Always up, always manageable.



# Single Node Demo

osoft BIG B-Monitor.

ion 0.3 [debug i386 galenh0 oct 31 2000 09:59:20]

les: [bm i810 e100b ide basicos]

ature GUID: {a00750ca-4815c969-155f8a83-4ae4e485}

essor 600MHz GenuineIntel x86 Family 6 Model 8 Stepping 1

lable Physical Memory = 126 MB

>1.0 Version: 02.10, Buses: 2, Mechanism: 1

512KB MB Flash.

Intel 85228 NIC, MAC=00-10-dc-b0-c7-d9 IO=0xc000, IRQ=0xb

IP starting DHCP for 00-10-dc-b0-c7-d9

No AK running.

If 0, Ip 172.31.40.109/255.255.248.0 Gate 0.0.0.0 Dhcp 172.31.40.107



Big Debug Console

File View Mode Help

172.31.40.109 (BMDP)  
Ready

```
9:37:41 DHCP: DHCP Server: 172.31.40.109, Mask: 255.255.248.0, Next: 172.31.40.110
9:37:41 DHCP: Gate: 0.0.0.0, Root: 172.31.40.109, Next: 172.31.40.109, Log: 172.31.40.109
10:37:04 DHCP: --> 00-10-dc-b8-c7-d9 -- 0.0.0.0:68 -- Discover MSGT BIG BIG --
10:37:05 DHCP: --> 00-10-dc-b8-c7-d9 -- 0.0.0.0:68 -- Request MSGT BIG BIG --
```

For Help, press F1

10:30:28.649 GetQueuedCompletion cli-00a90028/S: failed 121  
10:30:28.649 CloseConnection from 5



# BIG Debug Console

File View Code Help



172.31.40.109 (BMDP)  
Ready

```

9:37:41 DHCP: DHCP Server: 172.31.40.107, Mask: 255.255.248.0, Next: 172.31.40.110
9:37:41 DHCP: Gate: 0.0.0.0, Root: 172.31.40.107, Nboot: 172.31.40.107, Log: 172.31.40.107
9:37:41 172.31.40.109 DHCP: Announce
9:37:41 172.31.40.109 DHCP: DHCP:Conn 172.31.40.107:288 already established (rcv: 0, last...
9:37:41 172.31.40.109 DHCP: DHCP::DisconnectLocal 172.31.40.107:288, last rcvd: 2
9:37:41 172.31.40.109 DHCP: DHCP:Conn 172.31.40.107:288 (rcv: 0).
9:37:41 172.31.40.109 DHCP: Get Info from 172.31.40.107:8193 at 00:01:09.650.
9:37:41 172.31.40.109 DHCP: Get Info: Version 0.3 ldebug i386 galenb0 oct 31 2000 09:59:201...
9:38:57 172.31.40.109 DHCP: Session expired.
9:38:57 172.31.40.109 DHCP: ===== Session closed! =====
10:37:04 DHCP: --> 00-10-dc-b0-c7-d9 -- 0.0.0.0:68 -- Discover MSFT BIG BIG--
10:37:04 172.31.40.109 DHCP: Offer address to 00-10-dc-b0-c7-d9
10:37:05 DHCP: --> 00-10-dc-b0-c7-d9 -- 0.0.0.0:68 -- Request MSFT BIG BIG--
10:37:05 172.31.40.109 DHCP: Assigned address to 00-10-dc-b0-c7-d9
10:37:06 172.31.40.109 DHCP: Announce
10:37:06 172.31.40.109 DHCP: Session received 537329669 out of order, expected 1
10:37:06 172.31.40.109 DHCP: ID: IDE Drive: 29311MB Master 5307306 K0CPC03C IP10-5,0000-5...
10:37:06 172.31.40.109 DHCP: DHCP:Conn 172.31.40.107:288 already established (rcv: 0, last...
10:37:06 172.31.40.109 DHCP: DHCP::DisconnectLocal 172.31.40.107:288, last rcvd: 0
10:37:06 172.31.40.109 DHCP: DHCP:Conn 172.31.40.107:288 (rcv: 0).
10:37:06 172.31.40.109 DHCP: DHCP: Get Info from 172.31.40.107:8193 at 00:01:02.000.
10:37:06 172.31.40.109 DHCP: Get Info: Version 0.3 ldebug i386 galenb0 oct 31 2000 09:59:201...

```

For Help, press F1

10:30:28.649 GetQueuedCompletion cli-00a90028/S: failed 121

10:30:28.649 CloseConnection from 5

Windows 2000 Se

## BIG Debug Console

File View Code Help



172.31.40.109 (BMDP)  
http.exe

```

9:37:41 172.31.40.109 BMDP: Announce
9:37:41 172.31.40.109 BMDP: BMDP:Conn 172.31.40.107:288 already established (rcv: 0, last...
9:37:41 172.31.40.109 BMDP: BMDP::DisconnectLocal 172.31.40.107:288, last rcvd: 2
9:37:41 172.31.40.109 BMDP: BMDP:Conn 172.31.40.107:288 (rcv: 0).
9:37:41 172.31.40.109 BMDP: BMDP: Get Info from 172.31.40.107:8193 at 00:01:09.650.
9:37:41 172.31.40.109 BMDP: Get Info: Version 0.3 Idebug i386 galeh0 oct 31 2000 09:59:201...
9:38:57 172.31.40.109 BMDP: Session expired.
9:38:57 172.31.40.109 BMDP: ----- Session closed! -----
10:37:04 BMDP: --> 00-10-dc-b0-c7-d9 -- 0.0.0.0:68 -- Discover MSFT BIG BIC--
10:37:04 172.31.40.109 BMDP: Offer address to 00-10-dc-b0-c7-d9
10:37:05 BMDP: --> 00-10-dc-b0-c7-d9 -- 0.0.0.0:68 -- Request MSFT BIG BIC--
10:37:05 172.31.40.109 BMDP: Assigned address to 00-10-dc-b0-c7-d9
10:37:06 172.31.40.109 BMDP: Announce
10:37:06 172.31.40.109 BMDP: Session received 537329669 out of order, expected 1
10:37:06 172.31.40.109 BMDP: BI: IDE Drive: 2931MB Maxtor 5307306 K6-MCP30C P10-5.UDM0-5...
10:37:06 172.31.40.109 BMDP: BMDP:Conn 172.31.40.107:288 already established (rcv: 0, last...
10:37:06 172.31.40.109 BMDP: BMDP::DisconnectLocal 172.31.40.107:288, last rcvd: 0
10:37:06 172.31.40.109 BMDP: BMDP:Conn 172.31.40.107:288 (rcv: 0).
10:37:06 172.31.40.109 BMDP: BMDP: Get Info from 172.31.40.107:8193 at 00:01:02.000.
10:37:06 172.31.40.109 BMDP: Get Info: Version 0.3 Idebug i386 galeh0 oct 31 2000 09:59:201...
10:38:13 172.31.40.109 BMDP: BMDP: Console UDP from 172.31.40.107:8193 at 00:02:08.950.
10:38:13 172.31.40.109 BMDP: Microsoft BIG B-Monitor. UDP debug console)
10:38:13 172.31.40.109 BMDP: Version 0.3 Idebug i386 galeh0 oct 31 2000 09:59:201
10:38:13 172.31.40.109 BMDP: Modules: ba 1810 c100b ide basics0
10:38:13 172.31.40.109 BMDP: Machine: (IDE 2931MB,P10-5.UDM0-5:5)
10:38:13 172.31.40.109 BMDP: Load Engine: HDP console set
10:38:13 172.31.40.109 BMDP: BMDP: Load Engine from 172.31.40.107:8193 at 00:02:09.150.
10:38:13 172.31.40.109 BMDP: TFTP(013c150): Read 172.31.40.107:69/http.exe (localport=8200).
10:38:13 172.31.40.109 BMDP: Read http.exe
10:38:13 172.31.40.109 BMDP: Load Engine: Loading new BK image.
10:38:13 172.31.40.109 BMDP: TFTP(013c150): Transfer 1432 byte blocks.
10:38:14 172.31.40.109 BMDP: Load Engine: Command pending.. BK_TFTP=172.31.40.107 BK_IMAGE=h...
10:38:14 172.31.40.109 BMDP: Operation finished.
10:38:14 172.31.40.109 BMDP: TFTP(013c150): Download completed (176188 bytes).
10:38:14 172.31.40.109 BMDP: Load Engine: Command Successful. BK_TFTP=172.31.40.107 BK_IMAGE...
10:38:14 172.31.40.109 BMDP: BMDP: stack version 0.1

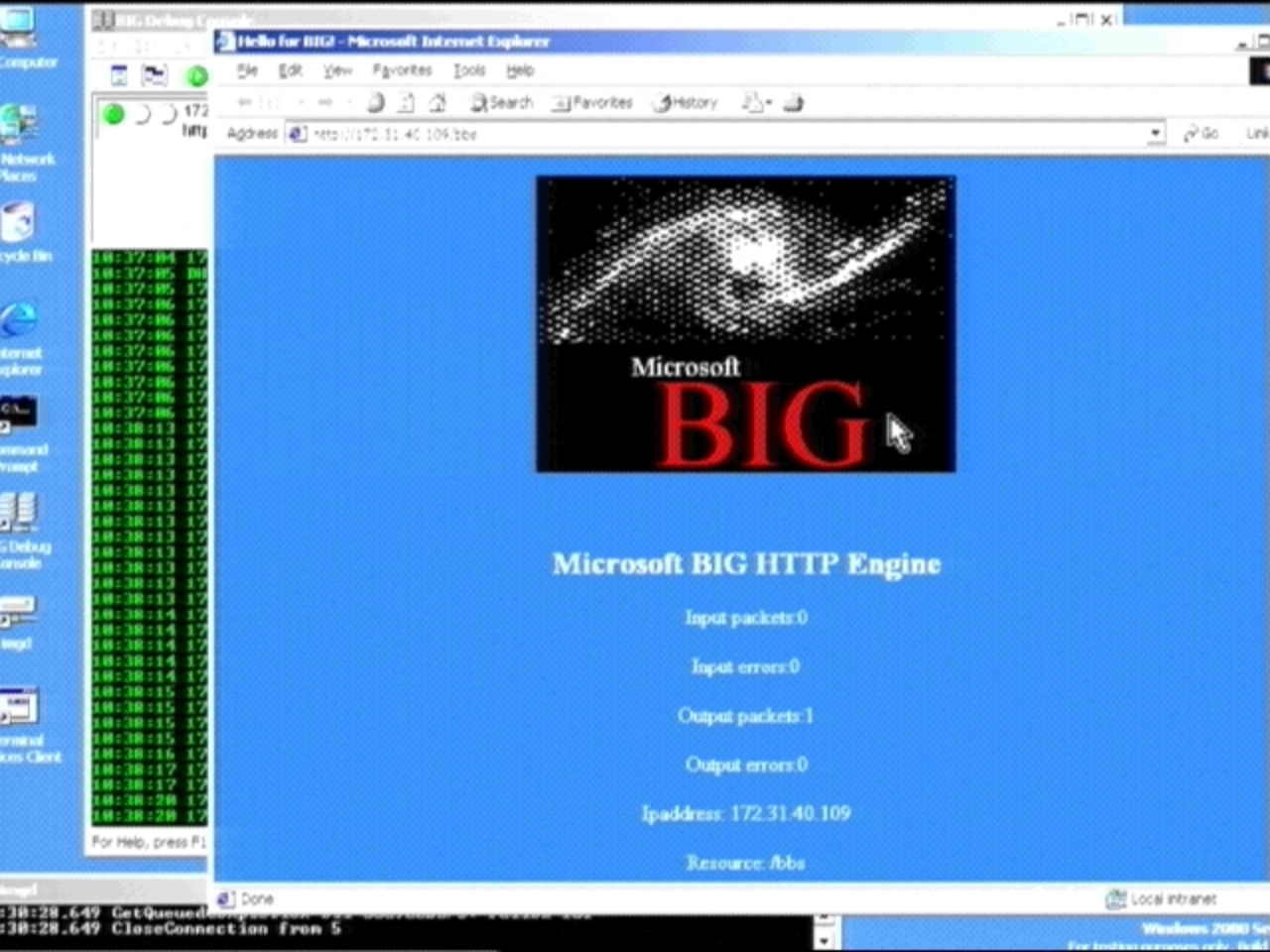
```

For Help, press F1

10:38:28.649 GetQueuedCompletion cli-00a90028/5: failed 121

10:38:28.649 CloseConnection from 5

Windows 2000 Se





## BIG Debug Console

File View Code Help

172.31.40.109 (BMDP)  
Ready

```

18:37:06 172.31.40.109 DMCP: DMCP:Conn 172.31.40.107:288 already established (rcv: 0, last...
18:37:06 172.31.40.109 DMCP: DMCP:DisconnectLocal 172.31.40.107:288, last rcvd: 0
18:37:06 172.31.40.109 DMCP: DMCP:Conn 172.31.40.107:288 (rcv: 0).
18:37:06 172.31.40.109 DMCP: DMCP: Get Info from 172.31.40.107:8193 at 00:02:00.000.
18:37:06 172.31.40.109 DMCP: Get Info: Version 0.3 Idebug 1386 galehh0 oct 31 2000 09:59:20...
18:38:13 172.31.40.109 DMCP: Console UDP from 172.31.40.107:8193 at 00:02:00.950.
18:38:13 172.31.40.109 DMCP: Microsoft BIG B-Monitor, (UDP debug console)
18:38:13 172.31.40.109 DMCP: Version 0.3 Idebug 1386 galehh0 oct 31 2000 09:59:20]
18:38:13 172.31.40.109 DMCP: Modules: hm 1810 c100b ide basics
18:38:13 172.31.40.109 DMCP: Machine: (IDE 29311MB,P10-5,0000-5:5)
18:38:13 172.31.40.109 DMCP:
18:38:13 172.31.40.109 DMCP: Load Engine: UDP console set
18:38:13 172.31.40.109 DMCP: DMCP: Load Engine from 172.31.40.107:8193 at 00:02:09.150.
18:38:13 172.31.40.109 DMCP: TFTP(013c150): Read 172.31.40.107:69/http.exe (localport=8200).
18:38:13 172.31.40.109 DMCP: Read http.exe
18:38:13 172.31.40.109 DMCP: Load Engine: Loading new OK image.
18:38:13 172.31.40.109 DMCP: TFTP(013c150): Transfer 1432 byte blocks.
18:38:14 172.31.40.109 DMCP: Load Engine: Command pending.. OK_TFTP=172.31.40.107 OK_IMAGE=h...
18:38:14 172.31.40.109 DMCP: Operation finished.
18:38:14 172.31.40.109 DMCP: TFTP(013c150): Download completed (17618 bytes).
18:38:14 172.31.40.109 DMCP: Load Engine: Command Successful. OK_TFTP=172.31.40.107 OK_IMAGE...
18:38:14 172.31.40.109 DMCP: OKERNEL stack version 0.1
18:38:15 172.31.40.109 DMCP: Time 0x4db97600 Networking protocols started
18:38:15 172.31.40.109 DMCP: OKNet::Initialize: BMonitor reports 1 nic interfaces
18:38:15 172.31.40.109 DMCP: SetMclInfo: IP Addr 172.31.40.109
18:38:15 172.31.40.109 DMCP: SetMclInfo: Default route through gateway 0.0.0.0
18:38:16 172.31.40.109 DMCP: TFTP(013c150): terminating session.
18:38:17 172.31.40.109 DMCP: InitHttpServer: Socket 0x9cf7a0 listening on port 88
18:38:17 172.31.40.109 DMCP: *** Entering spin loop waiting for interrupts
18:38:20 172.31.40.109 DMCP: HTTP GET /hbs -> 843 bytes -> HTTP/1.1 200 OK
18:38:20 172.31.40.109 DMCP: HTTP GET /statics/biglogo.gif -> 4342 bytes -> HTTP/1.1 200 OK
18:38:39 172.31.40.109 DMCP: HTTP GET /hbs -> 844 bytes -> HTTP/1.1 200 OK
18:38:39 172.31.40.109 DMCP: HTTP GET /statics/biglogo.gif -> 4342 bytes -> HTTP/1.1 200 OK
18:38:46 172.31.40.109 DMCP: DMCP: Stop from 172.31.40.107:8193 at 00:02:41.600.
18:38:46 172.31.40.109 DMCP: Stop Engine: Stopping.
18:38:46 172.31.40.109 DMCP: Stop Engine: Command pending.. OK_TFTP=172.31.40.107 OK_IMAGE=h...
18:38:47 172.31.40.109 DMCP: Stop Engine: Command Successful.

```

For Help, press F1

```

13:28:649 GetQueuedCompletion cli-00a90028/5: failed 121
13:28:649 CloseConnection from 5

```

## BIG Debug Console

File View Code Help

172.31.40.109 (BMDP)  
imgload.exe

```

18:38:39 172.31.40.109 DINGP: HTTP GET /statics/biglogo.gif ==> 4342 bytes ==> HTTP/1.1 200 OK
18:38:46 172.31.40.109 DINGP: BWP: Stop from 172.31.40.107:8193 at 00:02:41.600.
18:38:46 172.31.40.109 DINGP: Stop Engine: Stopping.
18:38:46 172.31.40.109 DINGP: Stop Engine: Command pending.. OK_TFTP=172.31.40.107 OK_IMAGE=h...
18:38:47 172.31.40.109 DINGP: Stop Engine: Command Successful.
18:39:09 172.31.40.109 DINGP: Console UDP from 172.31.40.107:8193 at 00:03:04.000.
18:39:09 172.31.40.109 DINGP: Microsoft BIG B-Monitor. IUDP debug console]
18:39:09 172.31.40.109 DINGP: Version 0.3 Idlebug 1386 galen0 oct 31 2000 09:59:20]
18:39:09 172.31.40.109 DINGP: Modules: hm 1810 c1000b ide basics
18:39:09 172.31.40.109 DINGP: Machine: IIDE 29311MB,P10-5,UD000-5:51
18:39:09 172.31.40.109 DINGP: Load Engine: UDP console set
18:39:09 172.31.40.109 DINGP:
18:39:09 172.31.40.109 DINGP: BWP: Load Engine from 172.31.40.107:8193 at 00:03:04.050.
18:39:09 172.31.40.109 DINGP: TFTP(013c150): Read 172.31.40.107:69/imgload.exe (localport=8...
18:39:09 172.31.40.109 DINGP: Read imgload.exe
18:39:09 172.31.40.109 DINGP: Load Engine: Loading new OK image.
18:39:09 172.31.40.109 DINGP: TFTP(013c150): Transfer 1432 byte blocks.
18:39:09 172.31.40.109 DINGP: Load Engine: Command pending.. OK_TFTP=172.31.40.107 OK_IMAGE=i...
18:39:09 172.31.40.109 DINGP: Operation finished.
18:39:09 172.31.40.109 DINGP: TFTP(013c150): Download completed (163906 bytes).
18:39:09 172.31.40.109 DINGP: Load Engine: Command Successful. OK_TFTP=172.31.40.107 OK_IMAGE...
18:39:10 172.31.40.109 DINGP: IMG: Server-172.31.40.107, Disk*, Part=bbsall.img
18:39:12 172.31.40.109 DINGP: TFTP(013c150): terminating session.
18:39:13 172.31.40.109 DINGP: Buffers: cnt=55, 11000000..?ef0000 (109 MB)
18:39:13 172.31.40.109 DINGP: OKERNEL stack version 0.1
18:39:13 172.31.40.109 DINGP: Time 0x6e16fbc8 Networking protocols started
18:39:13 172.31.40.109 DINGP: 0x0et::Initialize: BMonitor reports 1 nic interfaces
18:39:14 172.31.40.109 DINGP: SetMchInfo: IP Addr 172.31.40.109
18:39:14 172.31.40.109 DINGP: SetMchInfo: Default route through gateway 0.0.0.0
18:39:15 172.31.40.109 DINGP: IMG: Start Time: 0.000
18:39:15 172.31.40.109 DINGP: IMG: StartConnect: Created socket 0x98f9e8
18:39:16 172.31.40.109 DINGP: IMG: StartConnect: Socket 0x98f9e8 bound to port 2047
18:39:16 172.31.40.109 DINGP: IMG: State_Conn(00000000, 012, 012)
18:39:16 172.31.40.109 DINGP: IMG: Entering spin loop waiting for interrupts
18:39:16 172.31.40.109 DINGP: IMG: State_Stat(00000000, 012, 3225612)
18:39:16 172.31.40.109 DINGP: IMG: act=00 typ=0b chs=01:00:01..fe:00:bf sec=63..8369002
18:39:16 172.31.40.109 DINGP: DiskWrite 0 00000000..00007a00

```

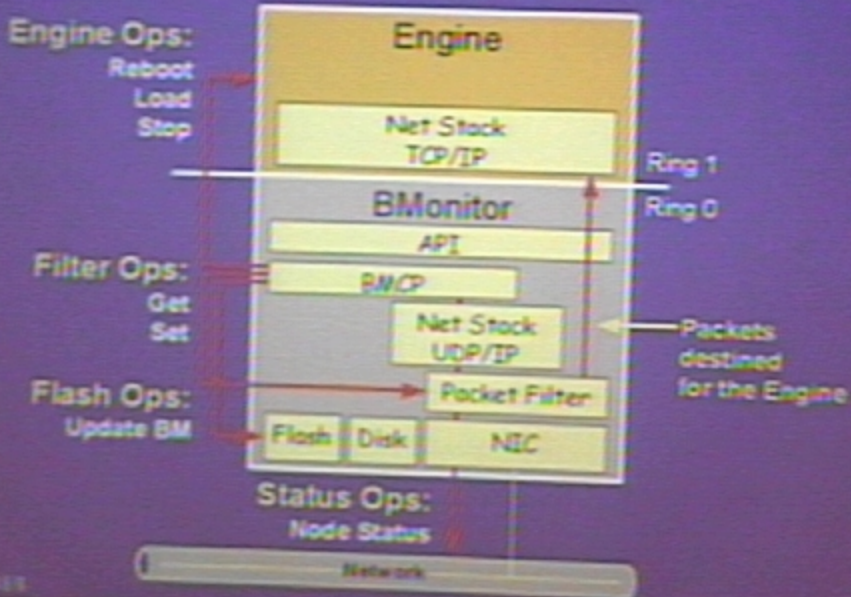
For Help, press F1

```

18:39:16.094 IMGD: Image=bbsall.img
18:39:16.094 IMGD: Size=1207083904

```

# Inside a Node

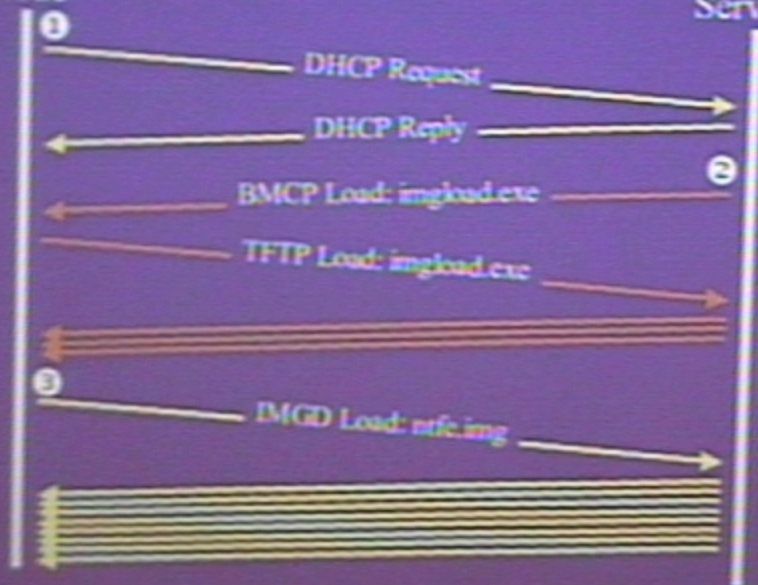




# Single Node Deployment

BMonitor  
Node

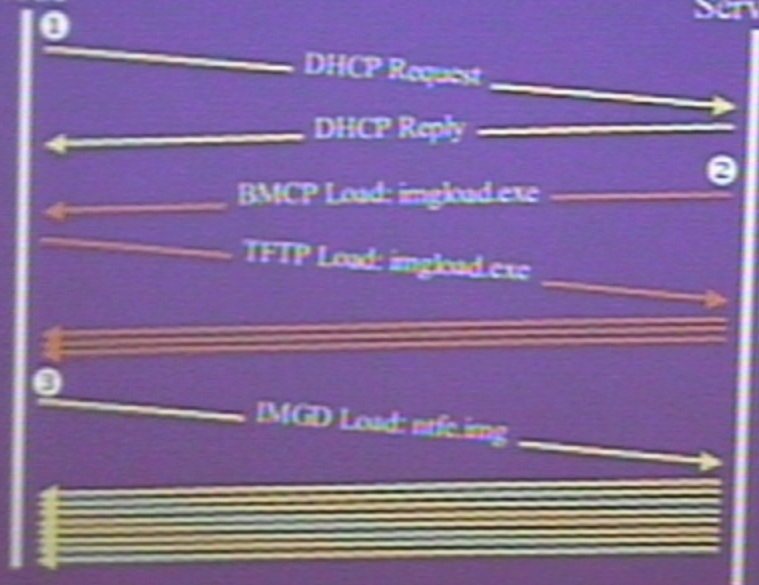
Management  
Service



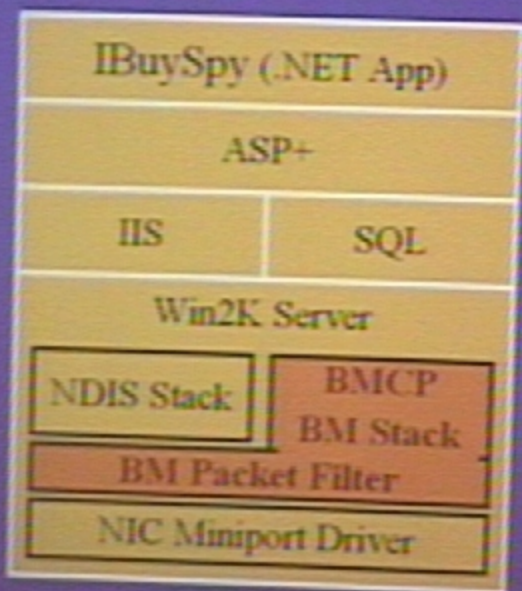
# Single Node Deployment

BMonitor  
Node

Management  
Service



# BIG Win2K Image





## Windows 2000 Server Setup

### Licensing Modes

Windows 2000 Server supports two licensing modes:



Select the licensing mode you want to use:

☒ Per server. Number of concurrent connections:

Each connection must have its own Client Access License.



☐ Per seat.

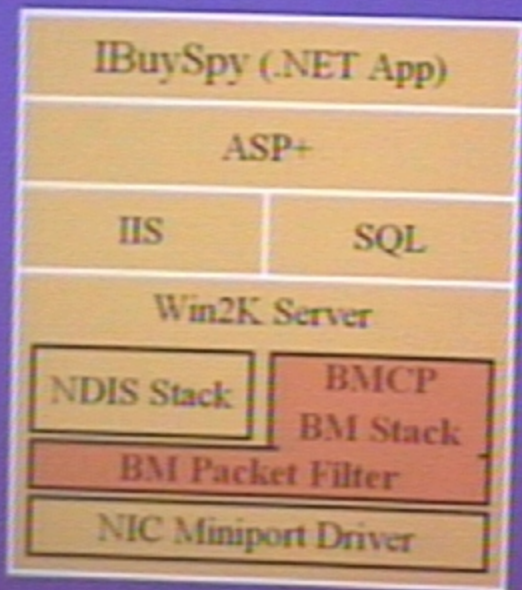
Each computer must have its own Client Access License.

To avoid violation of the License Agreement, use Licensing (which is located in Administrative Tools) to record the number of Client Access Licenses purchased.

< Back

Next >

# BIG Win2K Image



Windows 2000 Setup



Windows 2000 is now installed.

Setup needs to restart your computer to continue. Your computer will automatically restart in 15 seconds or when you click **Restart Now**.

**Restart Now**

**Windows 2000  
Server**



# Baseline Deployment Metrics\*

- BMonitor co-resides w/ BIOS on MB Flash.
  - BIOS boot: 9 seconds
  - BMonitor boot: +4 seconds = 13 secs.
- BMonitor deployment of Win2K on bare node
  - Win2K download (1.2GB): 2 minutes 7 seconds
  - Win2K boot w/ IIS: 30 seconds
  - Win2K Sysprep: 3 minutes 2 seconds
    - 2:17 sysprep, 0:15 stall, 0:30 boot
  - Win2K Deploy Total: ~6 minutes.

\* Clara with P3-600, 128Mb, 30Gb UDMA66 disk, 100Mb full-duplex Ethernet



Sign In Account Cart

SEARCH



Done

Done



NODE



Microsoft

**BIG**

31	5	0000	2425	MultiMark Controller	13
11	8	0000	1229	Hyperbolic Controller	10
				ACPI Controller	9

U Clock	:	6000 MHz	Cache Memory	:	256K
U Clock	:	6000 MHz	Cache Memory	:	256K
skette Drive A	:	1.44M, 3.5 in.	Display Type	:	EGA/UGA
skette Drive B	:	1.44M, 3.5 in.	DisplayType(s)	:	EGA/VGA
skette Drive C	:	None	SerialPort(s)	:	370 ZPD
l. Master Disk	:	None	Parallel Port(s)	:	470
k. Master Disk	:	None	Parallel Port(s) Size	:	4MB
e. Master Disk	:	None	Display Cache Size	:	4MB
e. Slave Disk	:	None			

ary Master HDD S.M.A.R.T. capability .... Disabled

ary Master HDD S.M.A.R.T. capability .... Disabled

# device listing ...

Device No.	Device No.	Func No.	Vendor ID	Device ID	Device Class	IRQ
1	1	0	0000	7125	Display Controller	5
31	5	0	0000	2425	Display Controller	13

# Baseline Deployment Metrics\*

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\* Curs with P3-600, 128Mb, 30Gb UDMA66 disk, 100Mb full-duplex Ethernet



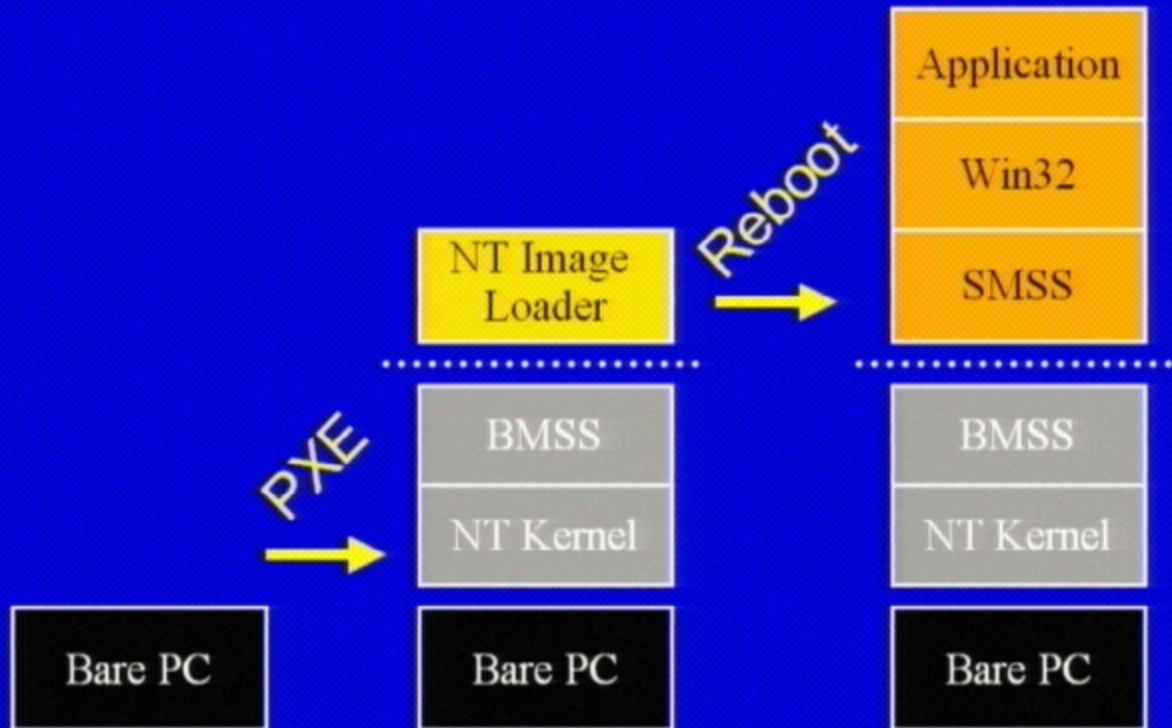
# Node Management Revisited

- *NT BMonitor*: Single-node building block.
  - Boots over network using PXE.
  - Runs exclusively from RAM.
  - Full Win2K IP Networking support + BMCP.
  - Full Win2K Disk support
  - Filters all network traffic.
  - Always up, always manageable.

# Node Management Revisited

- *NT BMonitor*: Single-node building block.
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  - Full Win2K IP Networking support + BMCP.
  - Full Win2K Disk support
  - Filters all network traffic.
  - Always up, always manageable.

# Deployment w/ NT BMonitor





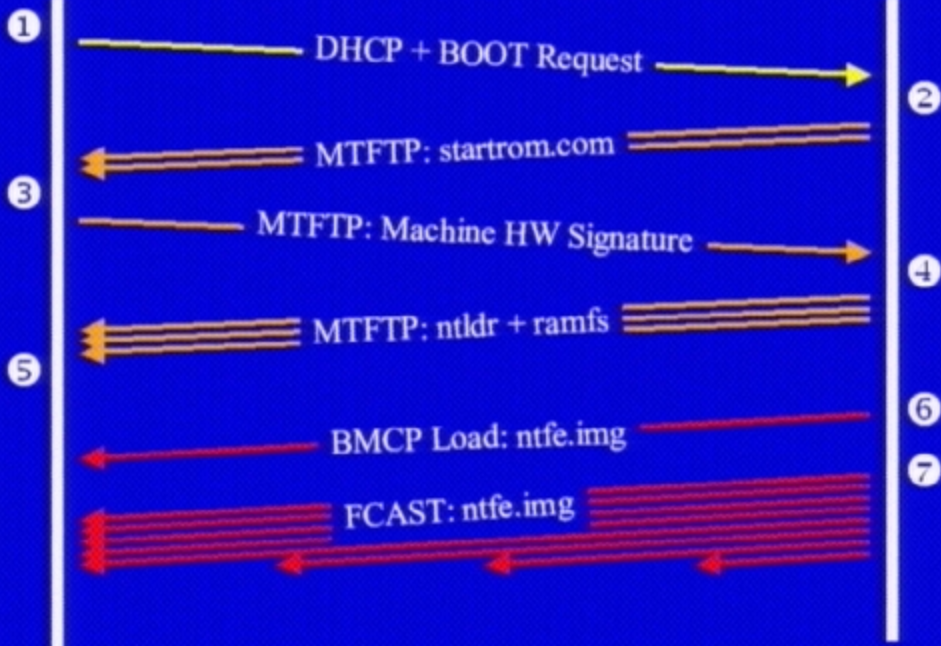
# NT Image Deployment

NT BMonitor

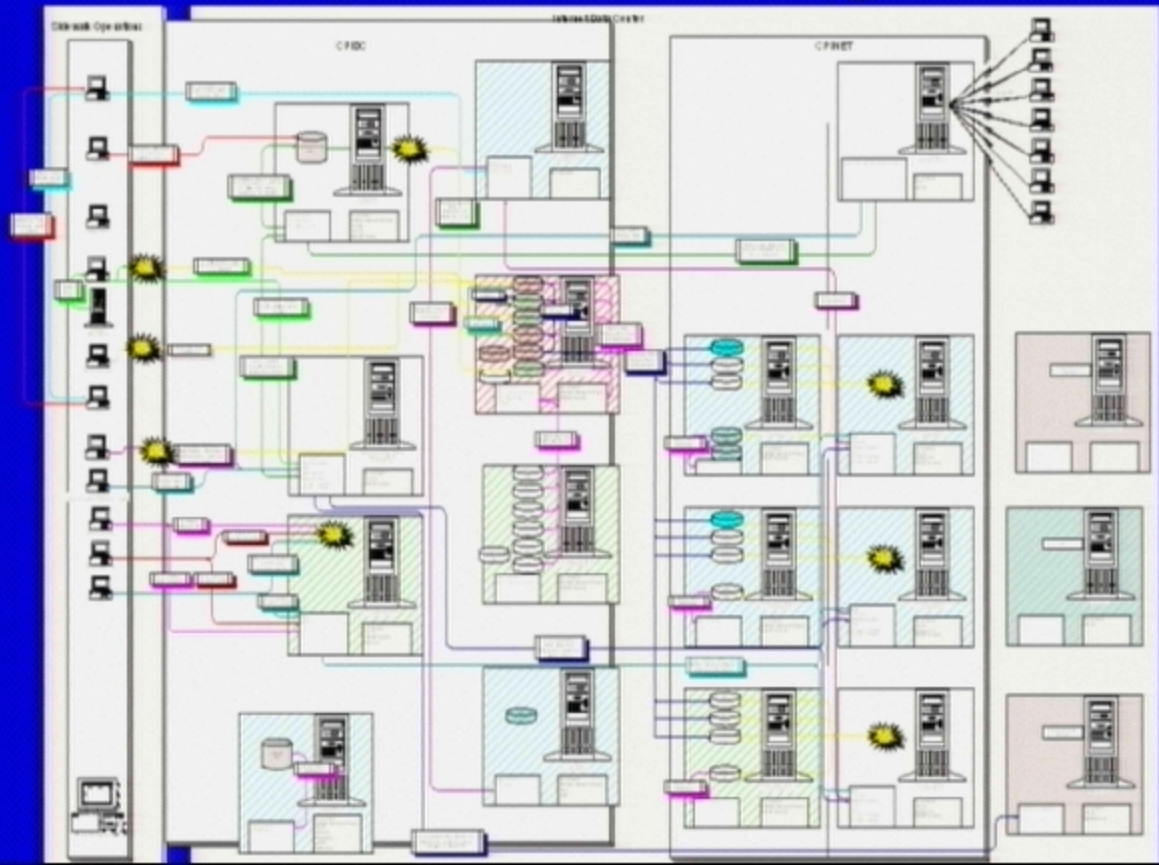
Node

Management

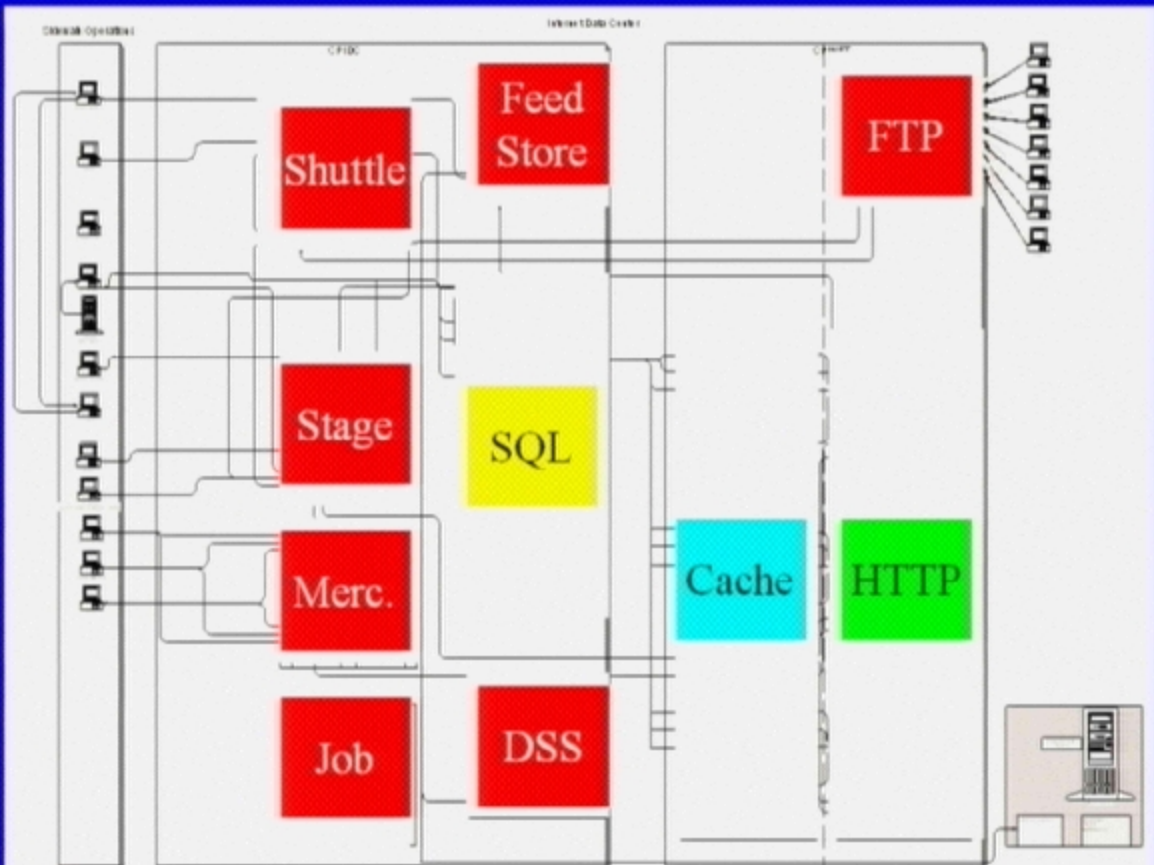
Service



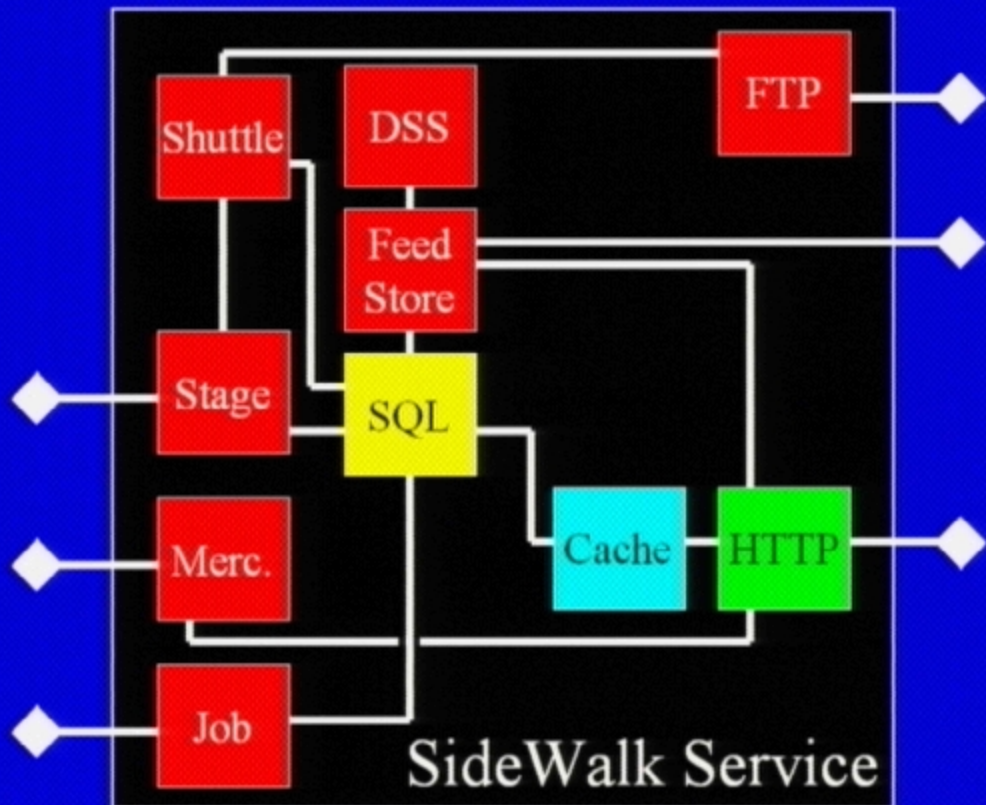
# SideWalk Visio Diagram



# Scale-invariant Service Definition

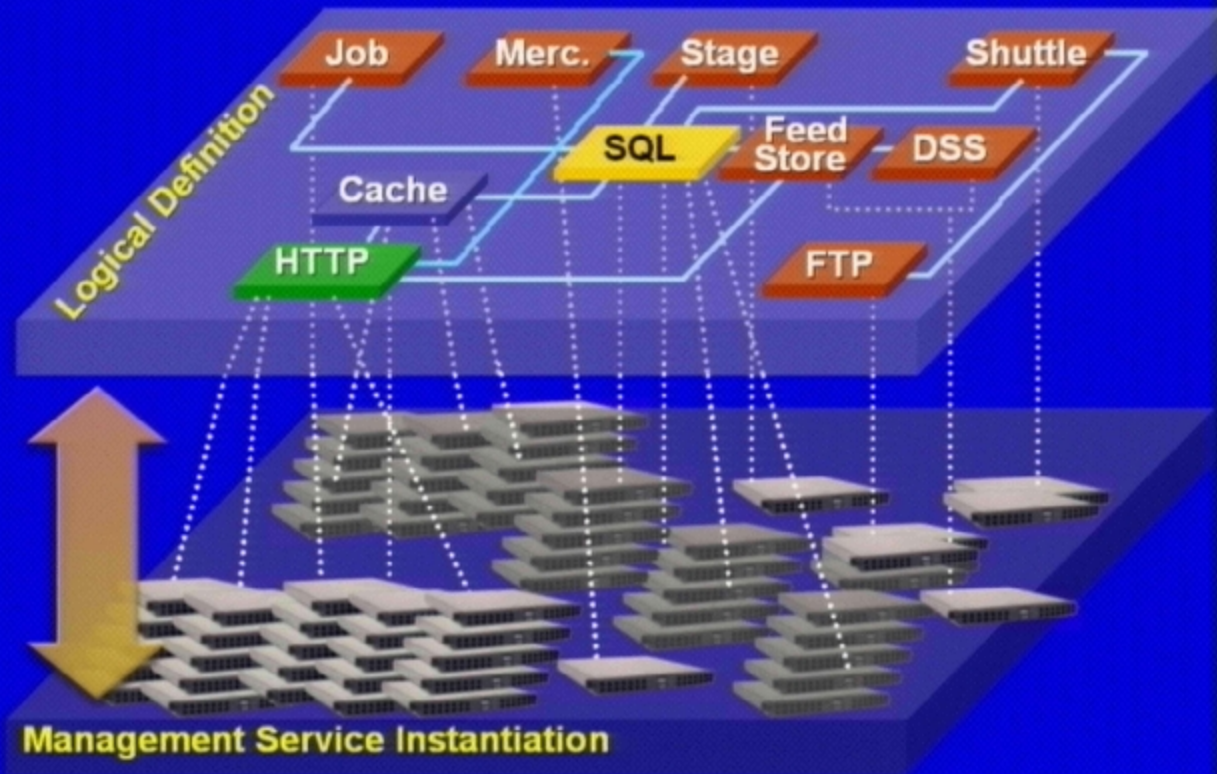


# Scale-invariant Service Definition





# Deployment: Logical to Physical Mapping



# Management: Automating Policy

- Policy as code:
  - Operates on instances through scale-invariant Service Definition.
- Management Service APIs for
  - Resource management for diverse device allocation,
  - Creating and evolving Service Definitions,
  - Instance State tracking ,
  - Node coordination primitives.

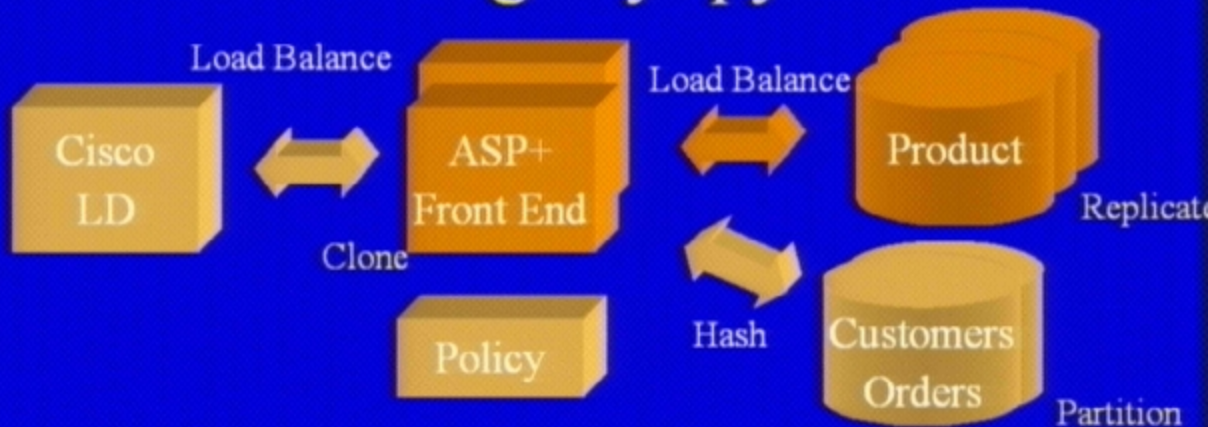
# IBuySpy



- .NET demo service (from Microsoft PDC)
  - Typical eCommerce site,
  - Excellent demonstration of .NET framework power.
- ASP+ Frontend:
  - ASP/HTML UI, Cookies, Middle-tier business objects.
- SQL Backend contains:
  - Products, reviews, shopping carts, customers and orders.



# IBigBuySpy



- More scalable implementation
  - Representative of dot-com deployment.
- Add policy to scale and manage the service.

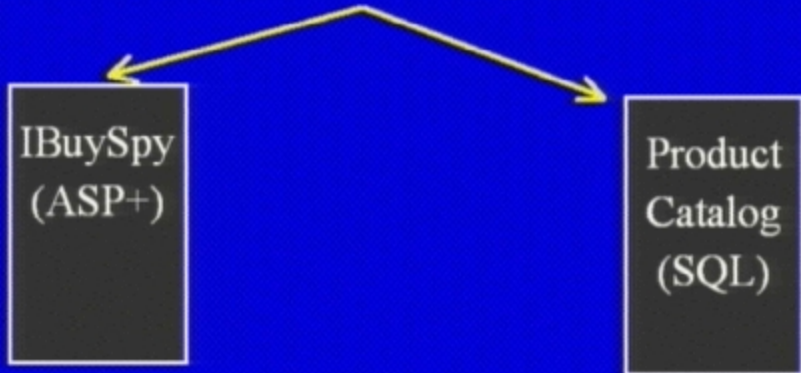


# *Creating* a Service

- A Service is comprised of:
  - *multiple nodes,*
  - *network topology,*
  - *operations processes, and*
  - *management policy.*
- In BIG, we capture these qualities with a Service Definition.

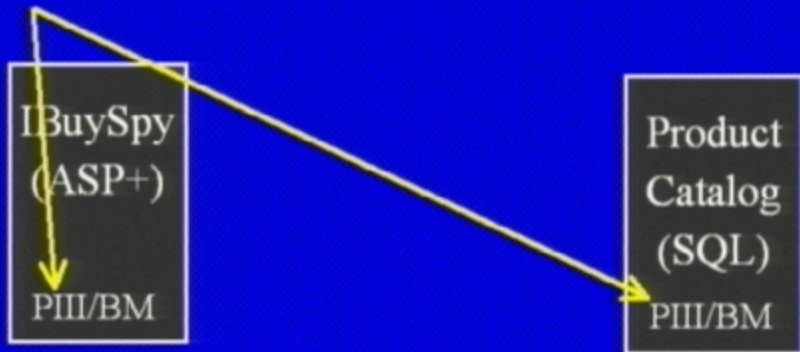
# Service Definition

A component is a complete description of the code that should run on a physical node.



# Service Definition

A component specifies the type of node it requires for deployment.





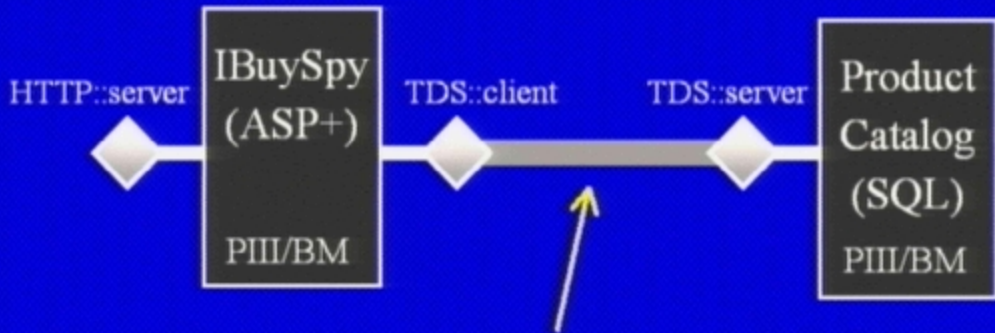
# Service Definition

A port is typed with a protocol and role.



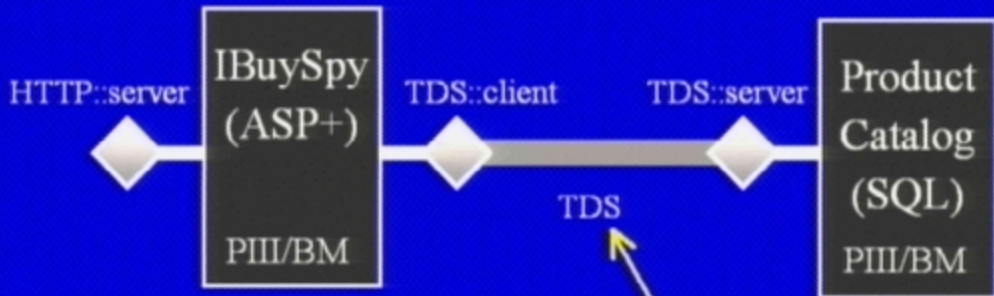


# Service Definition



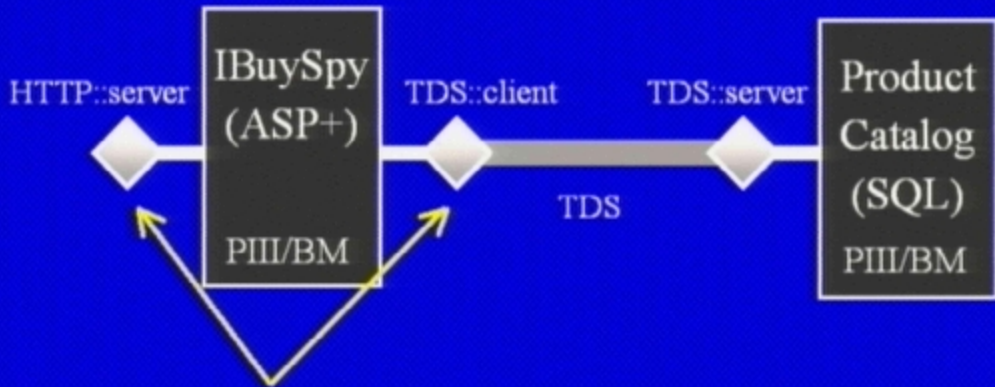
A wire represents a communication relationship between ports.

# Service Definition



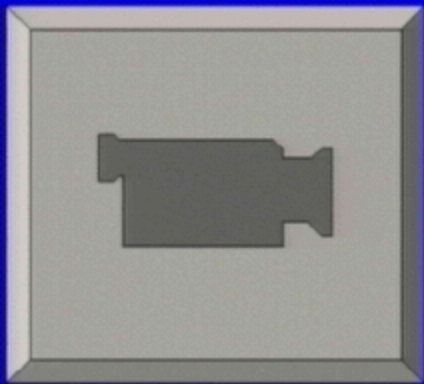
A wire is typed with a protocol.

# Service Definition



Ports define a component's operational namespace.

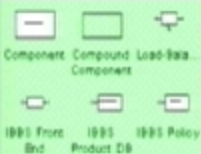
# Creation Demo



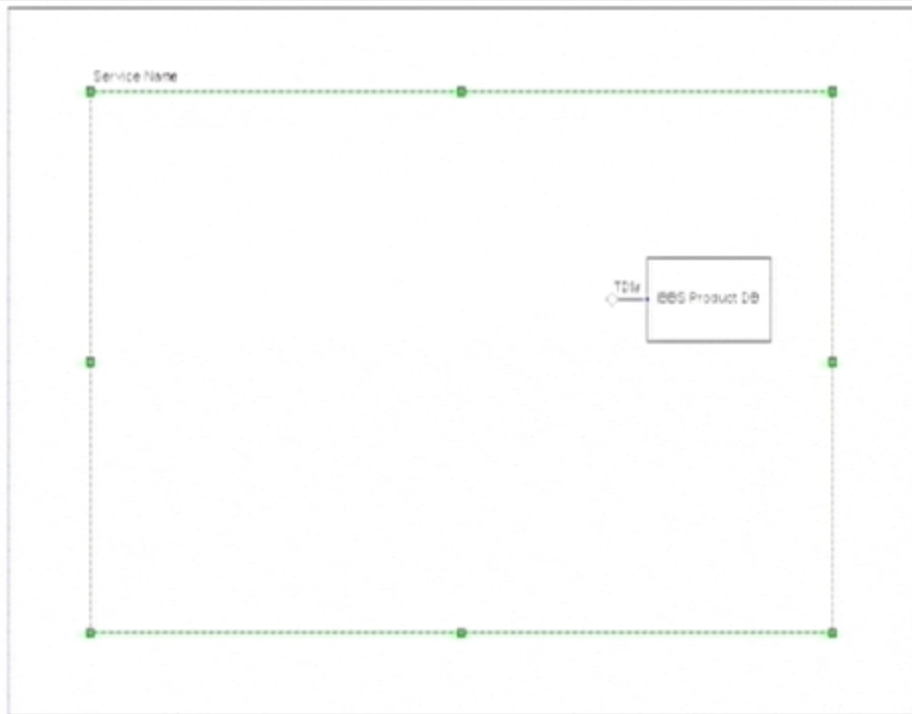
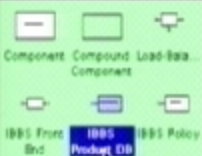
Note: Demo best view at 800x600 full screen.



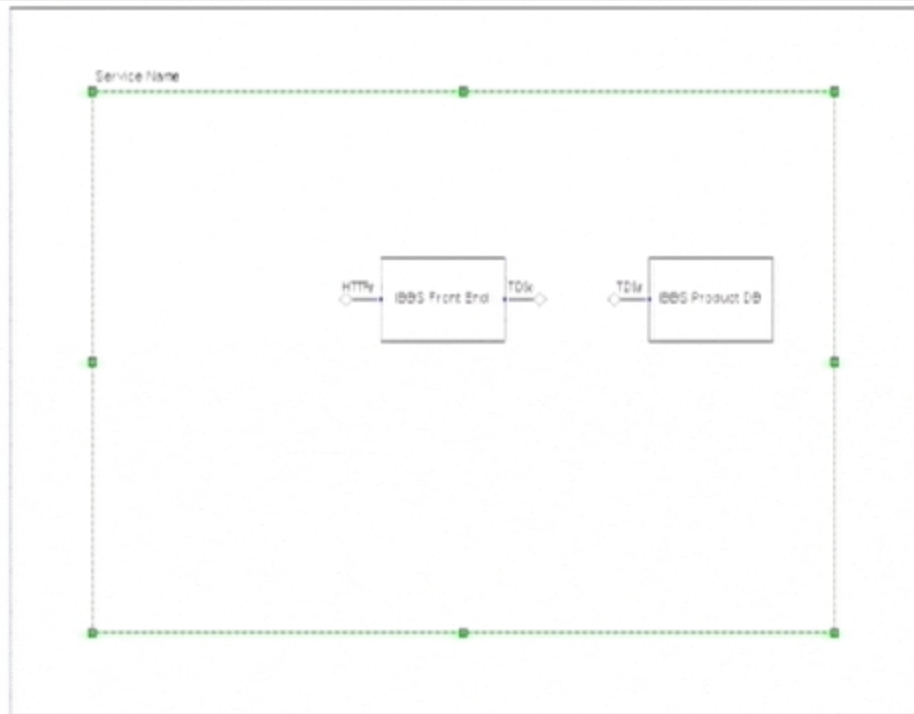
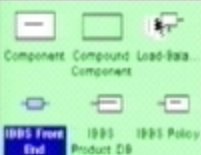
## Components



## Components

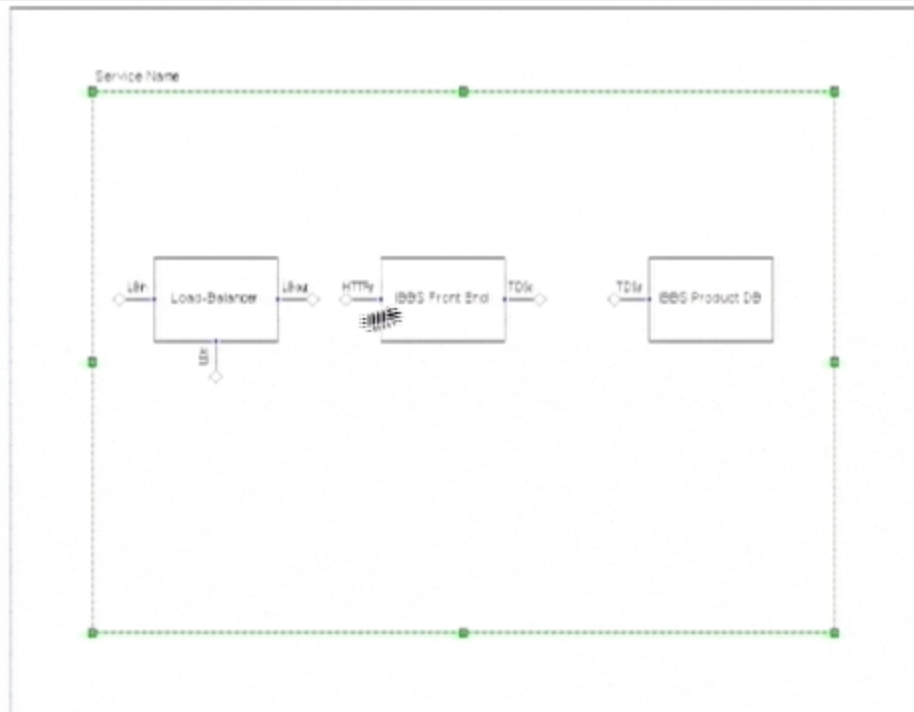
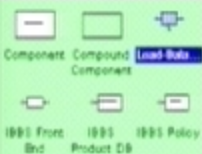


## Components

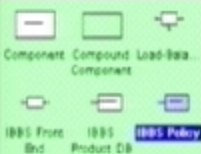




## Components



## Components



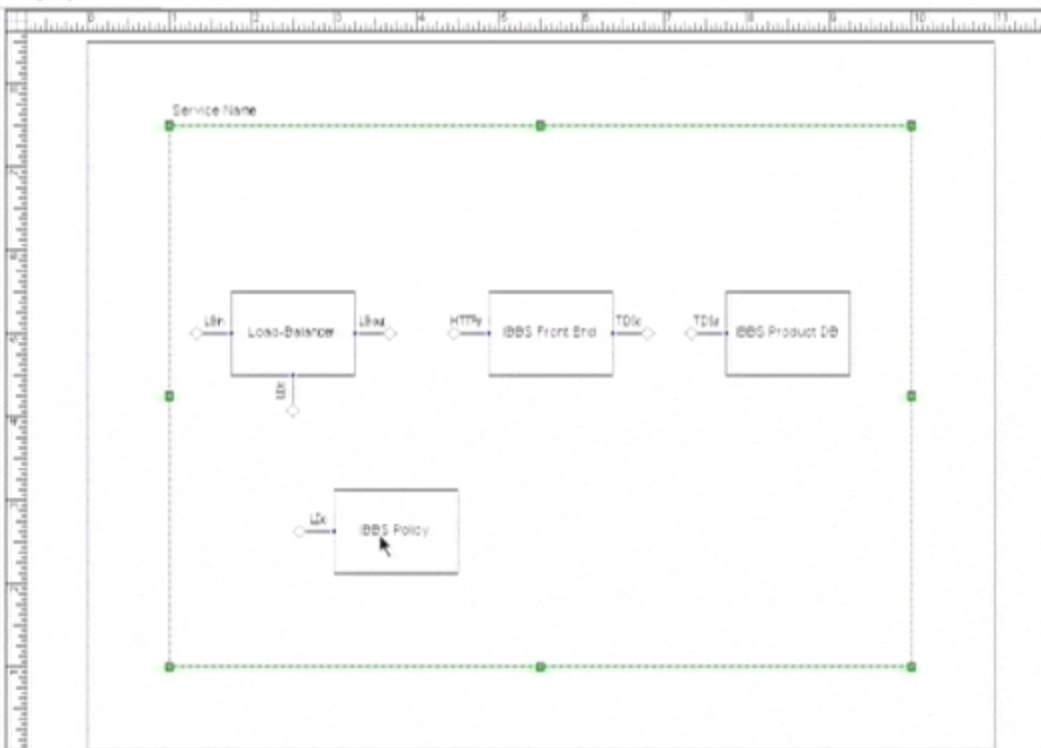
## Ports

## Components

Component Compound Load-Bal...  
Component

IBBS Front End IBBS Policy  
Product DB

## Ports

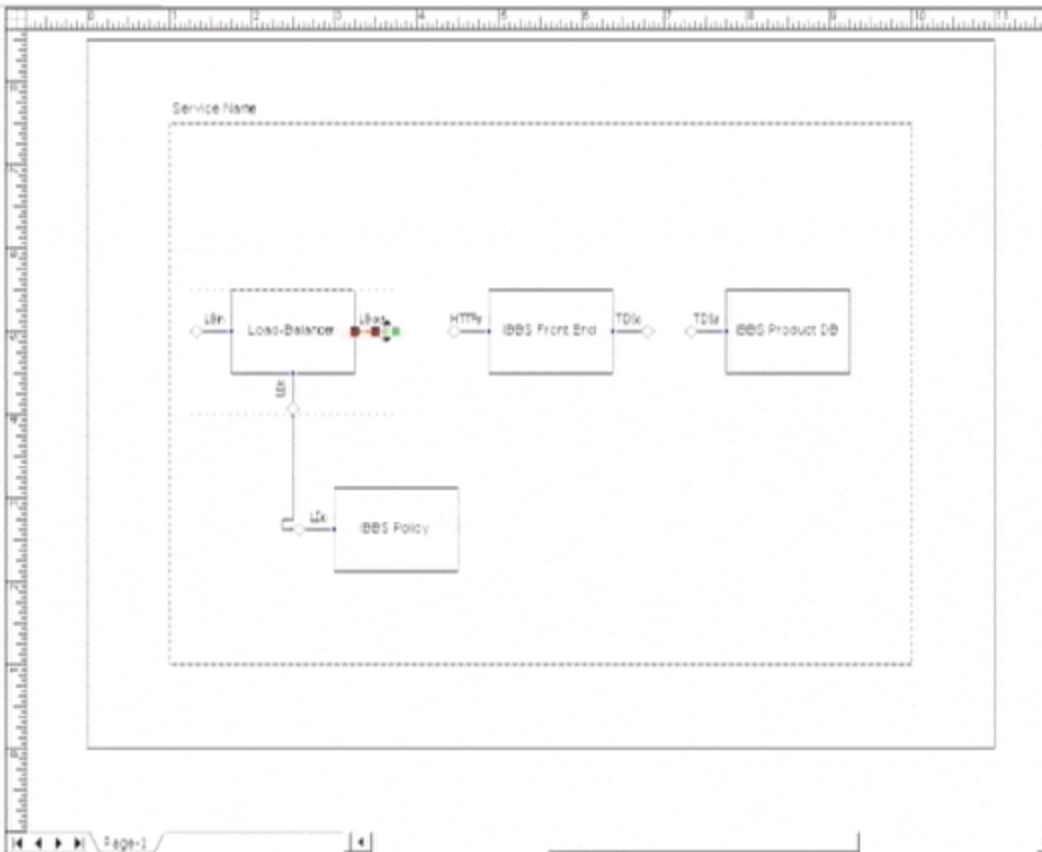




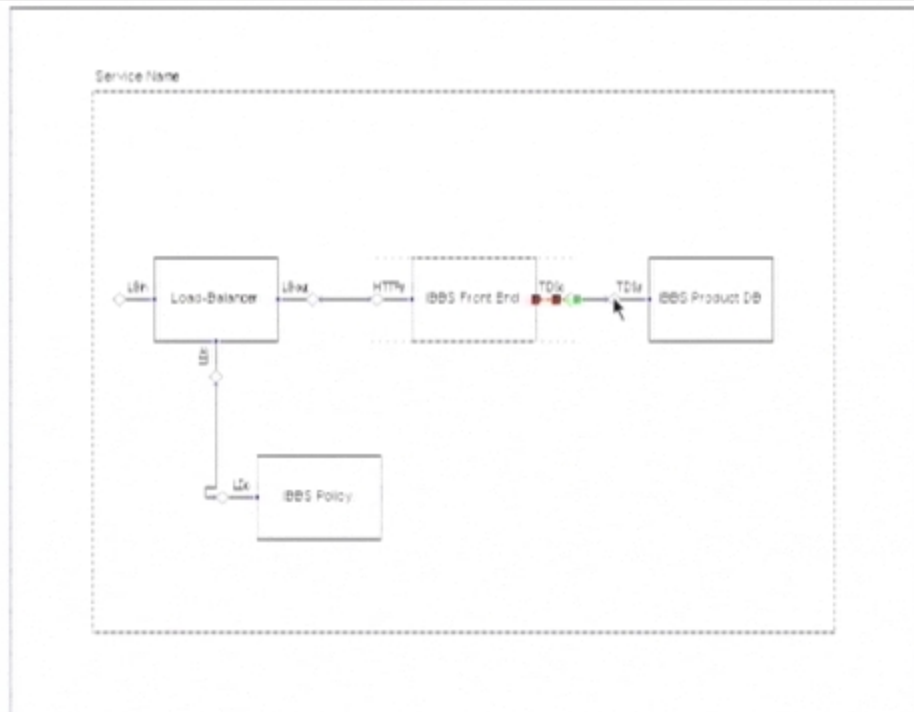
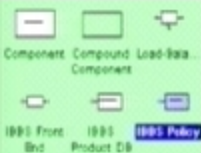
## Components

Component Compound Load-Balancer  
Component

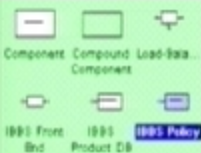
IBBS Front End IBBS Policy  
Product DB



## Components



## Components



Service Name



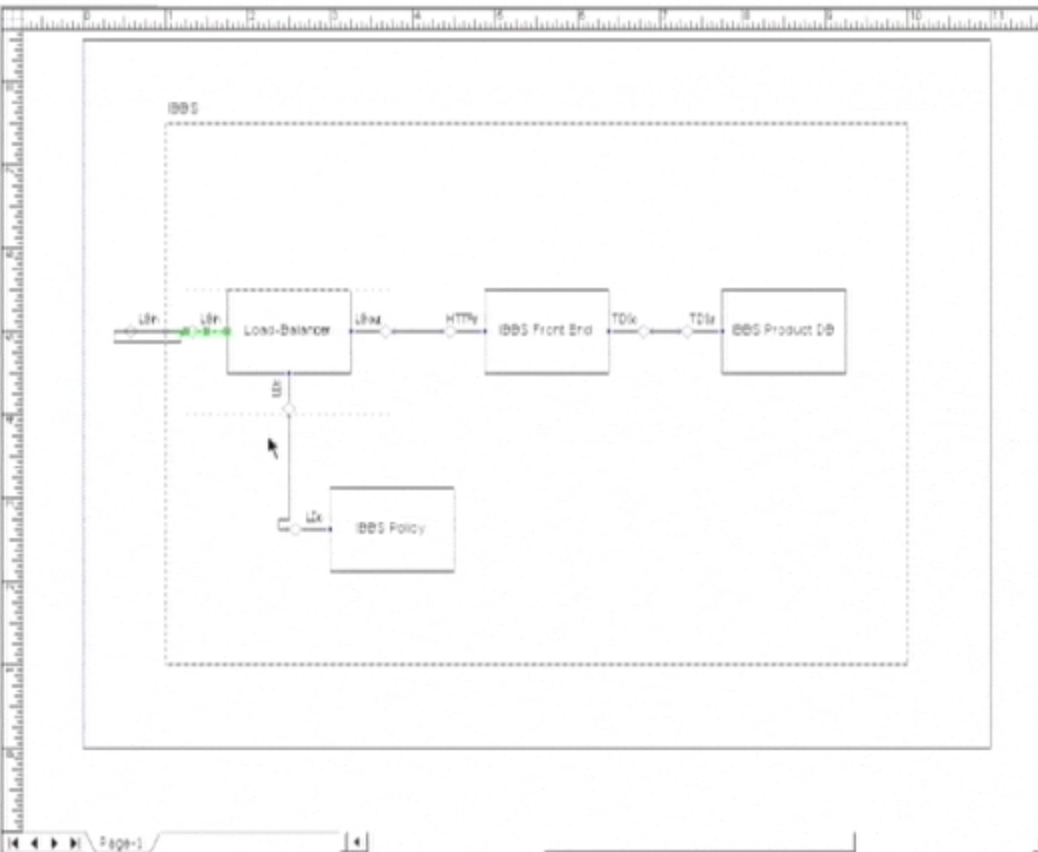


## Components

Component Compound Load-Bal...  
Component

IBBS Front End  
IBBS Product DB  
**IBBS Policy**

## Ports



# What's the BIG deal?

- Service Definition describes the entire service:
  - All Components, their interfaces, and Topology.
- Service Definition is *scale-invariant*:
  - Need not change with deployment size.
- Service Definition provides a namespace and operating environment for creating, provisioning, deploying, and managing.

# *Provisioning* a Service

- Services allocate nodes from a *Resource Manager*
  - Nodes are typically machines, including network hardware.
  - Nodes are provisioned by the *Service Hosting Environment*.
  - Every node has a *Node Type*.
- *Node Type* identifies a class of hardware.
  - GUID {1e3dfeba-fa2f-...} = PIII, 128MB RAM, 9GB HD.
  - Encodes extrinsic attributes: Node in UltraSecure cage.

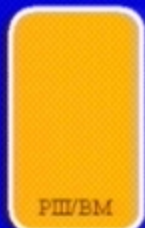
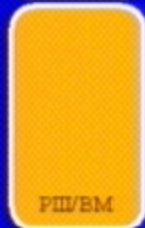
# *Deploying* a Service:

- A BIG .NET Service is deployed by instantiating physical nodes from logical components.
  - Deployment is driven by code called the *Constructor Policy*.
  - Nodes are allocated from a *Resource Manager*.
  - Component instances are recorded in a *State Tracking Service*, part of the BIG Management Service.



# Logical to Physical Mapping

Logical



Physical

# Logical to Physical Mapping

Logical



Physical

# Logical to Physical Mapping

A component provides the information needed to initialize a node to function as an instance.

Logical



Physical



# Logical to Physical Mapping

Logical



A component tracks a set of like instances.



Physical

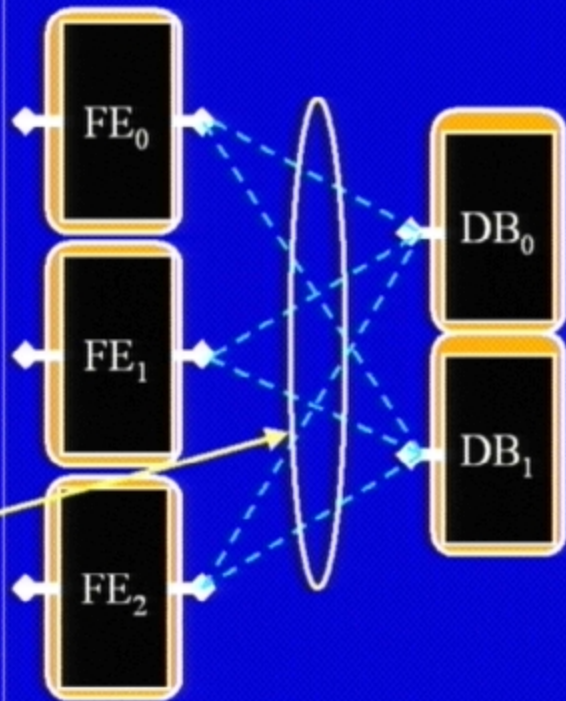


# Logical to Physical Mapping

Logical



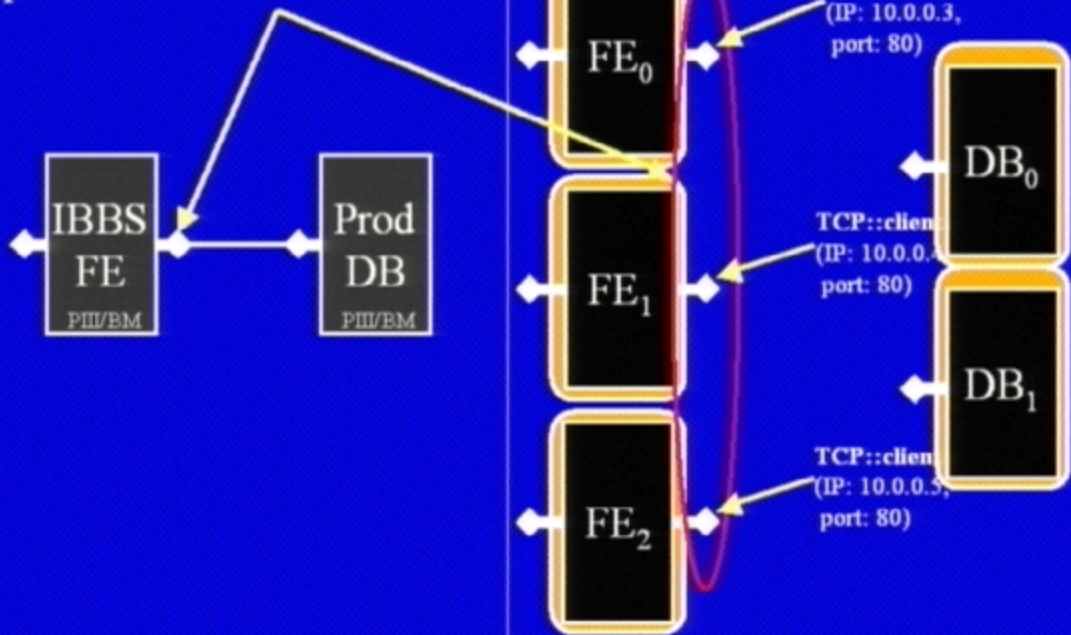
A wire tracks a mesh of allowable communications.



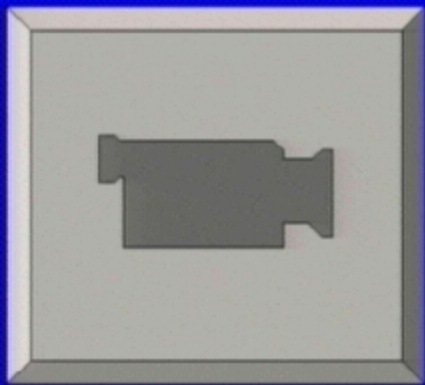
Physical

# Logical to Physical Mapping

A port tracks a set of SAPs.



# Deployment Demo







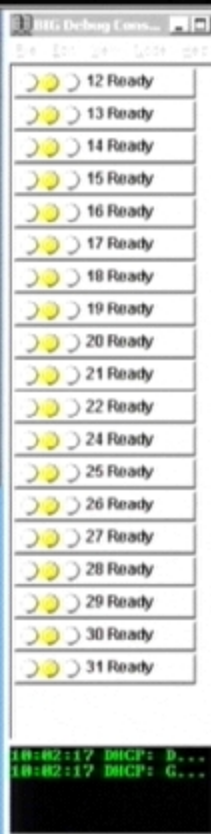
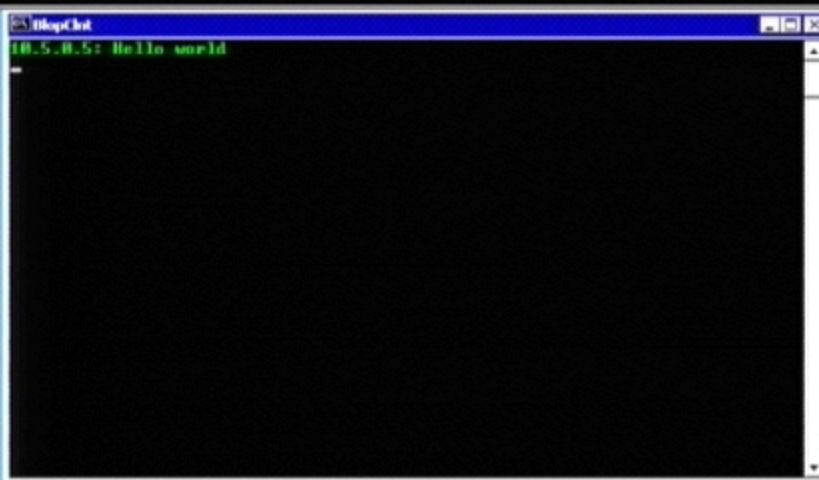
BIG Debug Cons...

File View Code Help

12 Ready
13 Ready
14 Ready
15 Ready
16 Ready
17 Ready
18 Ready
19 Ready
20 Ready
21 Ready
22 Ready
24 Ready
25 Ready
26 Ready
27 Ready
28 Ready
29 Ready
30 Ready
31 Ready

```
18:02:17 DHCP: D...
18:02:17 DHCP: G...
```







10.5.0.5: Hello world

Policy Demo  
Microsoft Windows 2000 [Version 5.00.2195]  
(C) Copyright 1985-2000 Microsoft Corp.  
c:\hbs>ip=

12 Ready  
13 Ready  
14 Ready  
15 Ready  
16 Ready  
17 Ready  
18 Ready  
19 Ready  
20 Ready  
21 Ready  
22 Ready  
24 Ready  
25 Ready  
26 Ready  
27 Ready  
28 Ready  
29 Ready  
30 Ready  
31 Ready

10:02:17 DHCP: D...  
10:02:17 DHCP: G...



```
BlipChat
10.5.0.5: Hello world
10.5.0.5: IHMS Policy: I'm up.
10.5.0.5: IHMS Policy: Connected to the resource manager.
10.5.0.5: IHMS Policy: Connected to the BIG runtime.
10.5.0.5: IHMS Policy: new Load Balancer (Cisco LD) at 10.7.0.2.
10.5.0.5: Cisco LD Proxy: I'm up.
10.5.0.5: Cisco LD Proxy: Created a new load balancing group.
10.5.0.5: IHMS Policy: constructor - creating two FEs and one ProductDB
10.5.0.5: IHMS Policy: new Front End at 10.3.0.12.
10.5.0.5: IHMS Policy: new Front End at 10.3.0.13.
10.5.0.5: IHMS Policy: new Product DB at 10.3.0.27.
```

BIG Debug Console

	12 Rebooting
	13 Rebooting
	14 Ready
	15 Ready
	16 Ready
	17 Ready
	18 Ready
	19 Ready
	20 Ready
	21 Ready
	22 Ready
	24 Ready
	25 Ready
	26 Ready
	27 Rebooting
	28 Ready
	29 Ready
	30 Ready
	31 Ready

10:02:17 DHCP: D...  
10:02:17 DHCP: G...



```
BkgClst
10.5.0.5: Hello world
10.5.0.5: IDMS Policy: I'm up.
10.5.0.5: IDMS Policy: Connected to the resource manager.
10.5.0.5: IDMS Policy: Connected to the BIG runtime.
10.5.0.5: IDMS Policy: new Load Balancer (Cisco LD) at 10.7.0.2.
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10.5.0.5: IDMS Policy: constructor - creating two FEs and one ProductDB
10.5.0.5: IDMS Policy: new Front End at 10.3.0.12.
10.5.0.5: IDMS Policy: new Front End at 10.3.0.13.
10.5.0.5: IDMS Policy: new Product DB at 10.3.0.27.
10.3.0.12: IDMS FE: I'm up.
10.3.0.27: IDMS Prod DB: I'm up.
10.3.0.27: IDMS Prod DB: Connected to the BIG runtime.
10.3.0.27: IDMS Prod DB: Registered IDEs SAP (5).
10.3.0.27: IDMS Prod DB: IDEs SAP attached to a wire (5)
```

BIG Debug Console

	12 IBBSFE,img
	13 IBBSFE,img
	14 Ready
	15 Ready
	16 Ready
	17 Ready
	18 Ready
	19 Ready
	20 Ready
	21 Ready
	22 Ready
	24 Ready
	25 Ready
	26 Ready
	27 ibbsprod.in
	28 Ready
	29 Ready
	30 Ready
	31 Ready

```
11:21:16 DHCP: ~...
11:21:29 DHCP: ~...
11:21:29 DHCP: ~...
11:21:34 DHCP: ~...
11:21:34 DHCP: ~...
```





```
BlipChat
10.5.0.5: Hello world
10.5.0.5: IHMS Policy: I'm up.
10.5.0.5: IHMS Policy: Connected to the resource manager.
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10.5.0.5: IHMS Policy: new Load Balancer (Cisco LD) at 10.7.0.2.
10.5.0.5: Cisco LD Proxy: I'm up.
10.5.0.5: Cisco LD Proxy: Created a new load balancing group.
10.5.0.5: IHMS Policy: constructor - creating two FEs and one ProductDB
10.5.0.5: IHMS Policy: new Front End at 10.3.0.12.
10.5.0.5: IHMS Policy: new Front End at 10.3.0.13.
10.5.0.5: IHMS Policy: new Product DB at 10.3.0.27.
10.3.0.13: IHMS FE: I'm up.
10.3.0.27: IHMS Prod DB: I'm up.
10.3.0.27: IHMS Prod DB: Connected to the BIG runtime.
10.3.0.27: IHMS Prod DB: Registered IDSs SAP (5).
10.3.0.27: IHMS Prod DB: IDSs SAP attached to a wire (5)
10.3.0.12: IHMS FE: I'm up.
```

BIG Debug Console

	12 IBBSFE.img
	13 IBBSFE.img
	14 Ready
	15 Ready
	16 Ready
	17 Ready
	18 Ready
	19 Ready
	20 Ready
	21 Ready
	22 Ready
	24 Ready
	25 Ready
	26 Ready
	27 ibbsprod.in
	28 Ready
	29 Ready
	30 Ready
	31 Ready

```
11:21:16 DHCP: ~...
11:21:29 DHCP: ~...
11:21:29 DHCP: ~...
11:21:34 DHCP: ~...
11:21:34 DHCP: ~...
```



```
BkgChk
10.5.0.5: Hello world
10.5.0.5: IBBS Policy: I'm up.
10.5.0.5: IBBS Policy: Connected to the resource manager.
10.5.0.5: IBBS Policy: Connected to the BIG runtime.
10.5.0.5: IBBS Policy: new Load Balancer (Cisco LD) at 10.7.0.2.
10.5.0.5: Cisco LD Proxy: I'm up.
10.5.0.5: Cisco LD Proxy: Created a new load balancing group.
10.5.0.5: IBBS Policy: constructor - creating two FEs and one ProductDB
10.5.0.5: IBBS Policy: new Front End at 10.3.0.12.
10.5.0.5: IBBS Policy: new Front End at 10.3.0.13.
10.5.0.5: IBBS Policy: new Product DB at 10.3.0.27.
10.3.0.13: IBBS FE: I'm up.
10.3.0.27: IBBS Prod DB: I'm up.
10.3.0.27: IBBS Prod DB: Connected to the BIG runtime.
10.3.0.27: IBBS Prod DB: Registered IDSs SAP (5).
10.3.0.27: IBBS Prod DB: IDSs SAP attached to a wire (5)
10.3.0.12: IBBS FE: I'm up.
10.3.0.13: IBBS FE: I'm ready!
10.5.0.5: Cisco LD Proxy: adding FE (10.3.0.13) to load balancing group.
```

BIG Debug Console

		12 IBBSFE.img
		13 IBBSFE.img
		14 Ready
		15 Ready
		16 Ready
		17 Ready
		18 Ready
		19 Ready
		20 Ready
		21 Ready
		22 Ready
		24 Ready
		25 Ready
		26 Ready
		27 ibbsprod.in
		28 Ready
		29 Ready
		30 Ready
		31 Ready

11:21:16 DHCP: ...  
11:21:29 DHCP: ...  
11:21:29 DHCP: ...  
11:21:34 DHCP: ...  
11:21:34 DHCP: ...



```
BkgClst
10.5.0.5: Hello world
10.5.0.5: IRRS Policy: I'm up.
10.5.0.5: IRRS Policy: Connected to the resource manager.
10.5.0.5: IRRS Policy: Connected to the BIG runtime.
10.5.0.5: IRRS Policy: new Load Balancer (Cisco LD) at 10.7.0.2.
10.5.0.5: Cisco LD Proxy: I'm up.
10.5.0.5: Cisco LD Proxy: Created a new load balancing group.
10.5.0.5: IRRS Policy: constructor - creating two FEs and one ProductDB
10.5.0.5: IRRS Policy: new Front End at 10.3.0.12.
10.5.0.5: IRRS Policy: new Front End at 10.3.0.13.
10.5.0.5: IRRS Policy: new Product DB at 10.3.0.27.
10.3.0.13: IRRS FE: I'm up.
10.3.0.27: IRRS Prod DB: I'm up.
10.3.0.27: IRRS Prod DB: Connected to the BIG runtime.
10.3.0.27: IRRS Prod DB: Registered IDEs SAP (5).
10.3.0.27: IRRS Prod DB: IDEs SAP attached to a wire (5)
10.3.0.12: IRRS FE: I'm up.
10.3.0.13: IRRS FE: I'm ready!
10.5.0.5: Cisco LD Proxy: adding FE (10.3.0.13) to load balancing group.
10.3.0.12: IRRS FE: I'm ready!
10.5.0.5: Cisco LD Proxy: adding FE (10.3.0.12) to load balancing group.
```

BIG Debug Console

	12 IRRSFE.img
	13 IRRSFE.img
	14 Ready
	15 Ready
	16 Ready
	17 Ready
	18 Ready
	19 Ready
	20 Ready
	21 Ready
	22 Ready
	24 Ready
	25 Ready
	26 Ready
	27 IRRSPROD.img
	28 Ready
	29 Ready
	30 Ready
	31 Ready

11:21:16 DHCP: ...  
11:21:29 DHCP: ...  
11:21:29 DHCP: ...  
11:21:34 DHCP: ...  
11:21:34 DHCP: ...





My Documents



My Computer



My Network  
Places



Recycle Bin



Internet  
Explorer



Microsoft Web  
Application ...



Big-Quadrant



Windows  
Media Player



Command  
Prompt



- My Documents
- My Computer
- My Network Places
- Recycle Bin
- Internet Explorer
- Microsoft Web Application ...
- Big-Quadr
- Windows Media Player
- Command Prompt

http://10.6.0.2/ - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Go Back Stop Reload Home Search Favorites History Print

Address http://10.6.0.2/

Go Links

Done

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Account



Cart



Services

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SEARCH

IP=10.0.0.12  
ProdDB=  
CountDB=1



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Deception

General

Munitions

Protection

Tools

Travel

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### Our most popular items this week

Interpreter Barrings  
Guard Dog Pacifier  
Fake Moustache Translator  
Multi-Purpose Rubber Band  
Perfect-Vision Glasses



Escape Problems? Get an Umbrella Rocket

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http://10.0.0.2/productlist.asp?CategoryID=15&selection=1 - Microsoft Internet Explorer

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Back Forward Stop Search Favorites History

Address http://10.0.0.2/productlist.asp?CategoryID=15&selection=1

Go Links

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ProdDB=10.0.0.27  
CountDB=1



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Special Price: \$9,999.99

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Special Price: \$799.99

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Correction Fluid

Special Price: \$1.99

[Add To Cart](#)



Identity Confusion Device

Special Price: \$6.99

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Counterfeit Creation Wallet

Special Price: \$999.99

[Add To Cart](#)

http://10.0.0.2/productlist.asp?CategoryID=15&selection=1

Internet

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SEARCH

IP=10.0.0.12  
ProdDB=10.0.0.27  
CountDB=1



IBUYSpy

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Protection

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Travel

## Cloaking Device



Worried about detection on your covert mission?

Confuse mission-threatening forces with this cloaking device. Powerful new features include string-activated pre-programmed phrases such as "Danger! Danger!", "Reach for the sky!", and other anti-enemy expressions. Hyper-reactive karate chop action deters even the most persistent villain.

Your Price: \$2,222.22

Model Number: 00000000



Add to Cart

## Reviews



Review this Product

View Source  
View Docs



# New IBBS Front-End

```
public void NewFE() {  
    ip = resourcemgr.AllocNode(compFE.NodeTypeGUID);  
    newFE = compFE.AddInstance(ip);  
}  
  
public void OnSAPAttachHTTPOnFE(SAP s) {  
    ciscold.Add(s);  
}
```

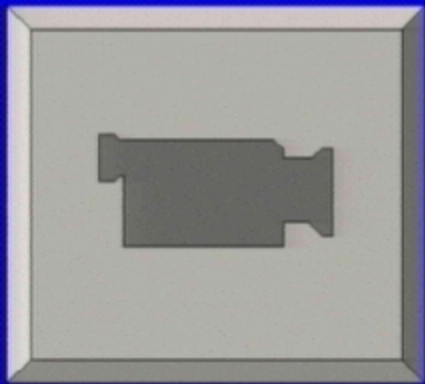
# What's the BIG deal?

- BIG deployment converts a set of physical nodes into a running .NET Service.
- Deployment constructor policy defines the initial configuration of the service.
- Deployment mechanisms:
  - Allocate nodes from a *Resource Manager*,
  - Deploy bits to node using BM/BMCP,
  - Track instances in the *State Tracking Service*.

# *Managing* a Service

- BIG provides mechanisms for automatic management policy:
  - Service growth and scaling,
  - Service evolution,
  - Operational maintenance.
- Policy is written to the scale-invariant Service Definition, but acts on instances.

# Management Demo





THE MOST SECRETEIVE PLACE TO SHOP ON THE INTERNET!



MODERN LIVING — ON THE EDGE

SEARCH

IP=10.0.0.12  
ProdDB=10.0.0.27  
CountDB=1



IBUYSpy

Communications

Deception

General

Munitions

Protection

Tools

Travel

## Cloaking Device



Worried about detection on your covert mission?

Confuse mission-threatening forces with this cloaking device. Powerful new features include string-activated pre-programmed phrases such as "Danger! Danger!", "Reach for the sky!", and other anti-enemy expressions. Hyper-reactive karate chop action deters even the most persistent villain.

Your Price: \$2,222.22

Model Number: 1111111



## Reviews



http://18.6.0.2/ProductDetails.aspx?productID=376 - Microsoft Internet Explorer

Web Application Stress - C:\Images\Stress.mdb - [Scripts : IBBS]

File Edit Scripts View Window Help



- Defaults
- IBBS
- Copy of IBBS

Server: 10.6.0.2

Notes: IBBS Demo Stress Load

Double-click on a script item to view details

Verb	Path	Group	Delay
GET	/default.asp	default	0
GET	/images/sitebgprodnav.gif	default	0
GET	/images/grid_background.gif	default	0
GET	/images/modemiving_bgprod.gif	default	0
GET	/productslist.aspx?CategoryID=1&selection=3	default	0
GET	/libuy/Spv.css	default	0
GET	/images/moet_secretive_place.gif	default	0
GET	/images/account.gif	default	0
GET	/images/cart.gif	default	0
GET	/images/services.gif	default	0
GET	/images/modemiving.gif	default	0
GET	/images/search.gif	default	0
GET	/images/arrowbutton.gif	default	0
GET	/images/arrowbutton.gif	default	0

Scripts : IBBS

[Review this Product](#)

[View Source](#)  
[View Docs](#)

Go Links

Cart Services

on?

h

nd

Internet

ibbpf.txt

```

10.5.0.5: Hello world
10.5.0.5: IBBS Policy: I'm up.
10.5.0.5: IBBS Policy: Connected to the resource manager.
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10.3.0.27: IBBS Prod DB: Registered IDSs SAP (5).
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10.3.0.12: IBBS FE: I'm ready!
10.5.0.5: Cisco LD Proxy: adding FE (10.3.0.12) to load balancing group.

```

BIG Debug Cons...

	12 IBBSFE.img
	13 IBBSFE.img
	14 Ready
	15 Ready
	16 Ready
	17 Ready
	18 Ready
	19 Ready
	20 Ready
	21 Ready
	22 Ready
	24 Ready
	25 Ready
	26 Ready
	27 ibbsprod.in
	28 Ready
	29 Ready
	30 Ready
	31 Ready

```

11:21:16 DHCP: ~...
11:21:29 DHCP: ~...
11:21:29 DHCP: ~...
11:21:34 DHCP: ~...
11:21:34 DHCP: ~...

```



```

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10.3.0.27: IBBS Prod DB: Registered TDS SAP (5).
10.3.0.27: IBBS Prod DB: TDS SAP attached to a wire (5)
10.3.0.12: IBBS FE: I'm up.
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10.3.0.12: IBBS FE: I'm ready!
10.5.0.5: Cisco LD Proxy: adding FE (10.3.0.12) to load balancing group.
  
```



### BIG Debug Console

- 12 IBBSFE.img
- 13 IBBSFE.img
- 14 Ready
- 15 Ready
- 16 Ready
- 17 Ready
- 18 Ready
- 19 Ready
- 20 Ready
- 21 Ready
- 22 Ready
- 24 Ready
- 25 Ready
- 26 Ready
- 27 ibbsprod.in
- 28 Ready
- 29 Ready
- 30 Ready
- 31 Ready

```

11:21:16 DMCP: ...
11:21:29 DMCP: ...
11:21:29 DMCP: ...
11:21:34 DMCP: ...
11:21:34 DMCP: ...
  
```





### BlipChat

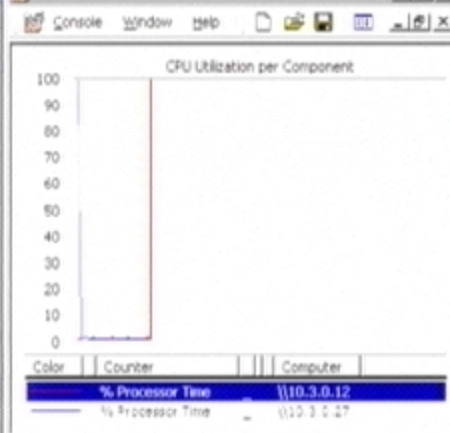
```

10.5.0.5: Hello world
10.5.0.5: IHBS Policy: I'm up.
10.5.0.5: IHBS Policy: Connected to the resource manager.
10.5.0.5: IHBS Policy: Connected to the BIG runtime.
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10.3.0.12: IHBS FE: I'm ready!
10.5.0.5: Cisco LD Proxy: adding FE (10.3.0.12) to load balancing group.
  
```

### Nodes per Component



### CPU Utilizations



### BIG Debug Console

12 IHBSFE.img

13 IHBSFE.img

14 Ready

15 Ready

16 Ready

17 Ready

18 Ready

19 Ready

20 Ready

21 Ready

22 Ready

24 Ready

25 Ready

26 Ready

27 hbsprod.in

28 Ready

29 Ready

30 Ready

31 Ready

11:21:16 DHCP: ...

11:21:29 DHCP: ...

11:21:29 DHCP: ...

11:21:34 DHCP: ...

11:21:34 DHCP: ...

Windows 2000 Service Pack 4



BGPClick

```

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10.5.0.5: IBBS Policy: I'm up.
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```

Nodes per Component



CPU Utilizations



BIG Debug Console

BIG Debug Console

- 12 IBBSFE.img
- 13 IBBSFE.img
- 14 Ready
- 15 Ready
- 16 Ready
- 17 Ready
- 18 Ready
- 19 Ready
- 20 Ready
- 21 Ready
- 22 Ready
- 24 Ready
- 25 Ready
- 26 Ready
- 27 ibbsprod.in
- 28 Ready
- 29 Ready
- 30 Ready
- 31 Ready

```

11:21:16 DHCP: ...
11:21:29 DHCP: ...
11:21:29 DHCP: ...
11:21:34 DHCP: ...
11:21:34 DHCP: ...
  
```

Windows 2000 for

http://18.6.0.2/ProductDetails.aspx?productID=376 - Microsoft Internet Explorer

Web Application Stress - C:\images\Stress.mdb - [Scripts : IBBS]

File Edit View Tools Window Help



Server: 10.6.0.2

Notes: IBBS Demo Stress Load

Debug

Test Status

Loading test script: localhost

Time Left:

Stop Test

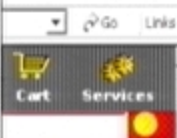
		Group	Delay
		default	0
		default	0
		default	0
		default	0
		default	0
		default	0
		default	0
GET	/images/account.gif	default	0
GET	/images/cart.gif	default	0
GET	/images/services.gif	default	0
GET	/images/modernliving.gif	default	0
GET	/images/search.gif	default	0
GET	/images/arrowbutton.gif	default	0
GET	/images/arrowbutton.gif	default	0

Scripts : IBBS



Review this Product

View Source  
View Docs



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nd

nd

nd

Internet



```

10.5.0.5: Hello world
10.5.0.5: IBMS Policy: I'm up.
10.5.0.5: IBMS Policy: Connected to the resource manager.
10.5.0.5: IBMS Policy: Connected to the BIG runtime.
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10.3.0.12: IBMS FE: I'm ready!
10.5.0.5: Cisco LD Proxy: adding FE (10.3.0.12) to load balancing group.
  
```



### BIG Debug Console

12 IBMSFE.img  
13 IBMSFE.img  
14 Ready  
15 Ready  
16 Ready  
17 Ready  
18 Ready  
19 Ready  
20 Ready  
21 Ready  
22 Ready  
24 Ready  
25 Ready  
26 Ready  
27 ibmsprod.in  
28 Ready  
29 Ready  
30 Ready  
31 Ready

```

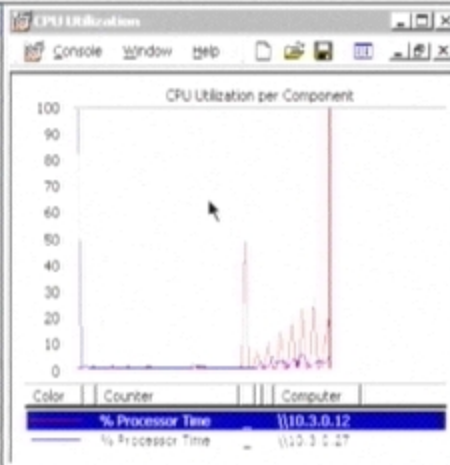
11:21:16 DHCP: ...
11:21:29 DHCP: ...
11:21:29 DHCP: ...
11:21:34 DHCP: ...
11:21:34 DHCP: ...
  
```





```

10.5.0.5: Hello world
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### BIG Debug Console

12 IBBSFE.img  
13 IBBSFE.img  
14 Ready  
15 Ready  
16 Ready  
17 Ready  
18 Ready  
19 Ready  
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21 Ready  
22 Ready  
24 Ready  
25 Ready  
26 Ready  
27 ibbsprod.in  
28 Ready  
29 Ready  
30 Ready  
31 Ready

```

11:21:16 DHCP: ...
11:21:29 DHCP: ...
11:21:29 DHCP: ...
11:21:34 DHCP: ...
11:21:34 DHCP: ...
  
```

THE MOST SECREIVE PLACE TO SHOP ON THE INTERNET!



MODERN LIVING — ON THE EDGE

SEARCH

IP=10.0.0.12  
ProdDB=10.0.0.27  
CountDB=1



IBUYSpy

Communications

Deception

General

Munitions

Protection

Tools

Travel

## Cloaking Device



Worried about detection on your covert mission?

Confuse mission-threatening forces with this cloaking device. Powerful new features include string-activated pre-programmed phrases such as "Danger! Danger!", "Reach for the sky!", and other anti-enemy expressions. Hyper-reactive karate chop action deters even the most persistent villain.

Your Price: \$2,222.22

Model Number: 1171111



## Reviews

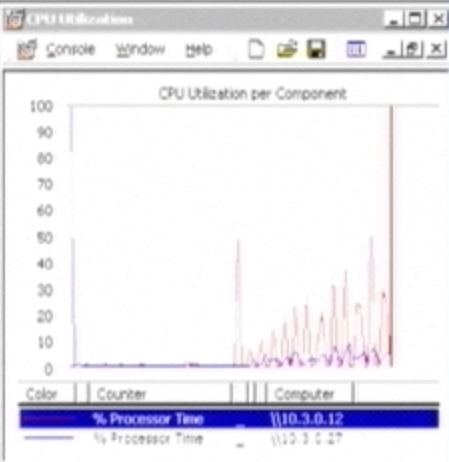


View Source  
View Docs



```

Bkgit>
10.5.0.5: Hello world
10.5.0.5: IBBS Policy: I'm up.
10.5.0.5: IBBS Policy: Connected to the resource manager.
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```



BIG Debug Console

- 12 IBBSFE.img
- 13 IBBSFE.img
- 14 Ready
- 15 Ready
- 16 Ready
- 17 Ready
- 18 Ready
- 19 Ready
- 20 Ready
- 21 Ready
- 22 Ready
- 24 Ready
- 25 Ready
- 26 Ready
- 27 bbsprod.in
- 28 Ready
- 29 Ready
- 30 Ready
- 31 Ready

```

11:21:16 DMCP: ...
11:21:29 DMCP: ...
11:21:29 DMCP: ...
11:21:34 DMCP: ...
11:21:34 DMCP: ...
  
```







http://10.6.0.2/ProductDetails.aspx?productID=376 - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Reload Search Favorites History

Address http://10.6.0.2/ProductDetails.aspx?productID=376

Go Links

Opening page http://10.6.0.2/ProductDetails.aspx?productID=376...

Internet

THE MOST SECRETEIVE PLACE TO SHOP ON THE INTERNET!



MODERN LIVING — ON THE EDGE

SEARCH

IP=10.0.0.12  
ProdID=10.0.0.27  
CountDB=1



IBUYSpy

Communications

Deception

General

Munitions

Protection

Tools

Travel

## Cloaking Device



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Your Price: \$2,222.22

Model Number: 1171181



## Reviews



View Source  
View Docs



BigIP-01

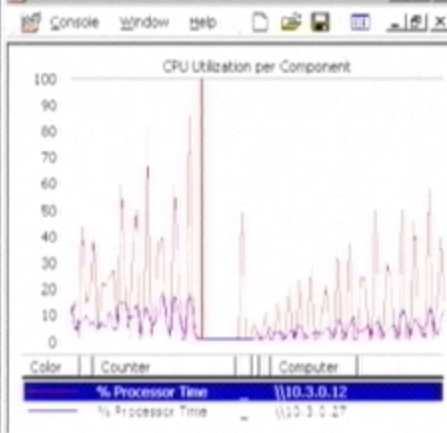
```

10.5.0.5: Hello world
10.5.0.5: IRRS Policy: I'm up.
10.5.0.5: IRRS Policy: Connected to the resource manager.
10.5.0.5: IRRS Policy: Connected to the BIG runtime.
10.5.0.5: IRRS Policy: new Load Balancer (Cisco LD1 at 10.7.0.2.
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10.3.0.27: IRRS Prod DB: Connected to the BIG runtime.
10.3.0.27: IRRS Prod DB: Registered DBs SAP (5).
10.3.0.27: IRRS Prod DB: DBs SAP attached to a wire (5)
10.3.0.12: IRRS FE: I'm up.
10.3.0.13: IRRS FE: I'm ready!
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10.3.0.12: IRRS FE: I'm ready!
10.5.0.5: Cisco LD Proxy: adding FE (10.3.0.12) to load balancing group.
  
```

Nodes per Component



CPU Utilization



BIG Debug Console

12 IRRSFE,img

13 IRRSFE,img

14 Ready

15 Ready

16 Ready

17 Ready

18 Ready

19 Ready

20 Ready

21 Ready

22 Ready

24 Ready

25 Ready

26 Ready

27 IRRSPROD,img

28 Ready

29 Ready

30 Ready

31 Ready

11:21:16 DMCP: ---

11:21:29 DMCP: ---

11:21:29 DMCP: ---

11:21:34 DMCP: ---

11:21:34 DMCP: ---

Windows 2000 Server



BigIP Job

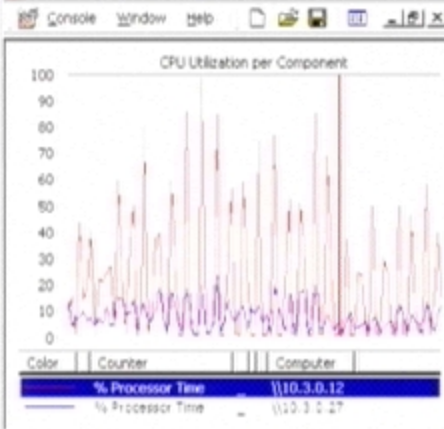
```

10.5.0.5: Hello world
10.5.0.5: IBHS Policy: I'm up.
10.5.0.5: IBHS Policy: Connected to the resource manager.
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10.3.0.12: IBHS FE: I'm ready!
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```

Nodes per Component



CPU Utilizations



BIG Debug Console

BIG Debug Console

- 12 IBHSFE.img
- 13 IBHSFE.img
- 14 Ready
- 15 Ready
- 16 Ready
- 17 Ready
- 18 Ready
- 19 Ready
- 20 Ready
- 21 Ready
- 22 Ready
- 24 Ready
- 25 Ready
- 26 Ready
- 27 ibhsprod.in
- 28 Ready
- 29 Ready
- 30 Ready
- 31 Ready

```

11:21:16 DMCP: ~...
11:21:29 DMCP: ~...
11:21:29 DMCP: ~...
11:21:34 DMCP: ~...
11:21:34 DMCP: ~...
  
```

11:21:16 DMCP: ~...  
11:21:29 DMCP: ~...  
11:21:29 DMCP: ~...  
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11:21:34 DMCP: ~...

11:21:16 DMCP: ~...  
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11:21:16 DMCP: ~...  
11:21:29 DMCP: ~...  
11:21:29 DMCP: ~...  
11:21:34 DMCP: ~...  
11:21:34 DMCP: ~...



# IBBS Growth

```
public void OnCPUOverload(String ip) {  
    component = service.LookupByIp(ip);  
  
    if (component.Name = "IBBS Front-End"){  
        NewFE();  
    } else if (component.Name = "IBBS Prod") {  
        NewProdSQL();  
    } else {  
        throw new Exception();  
    }  
}
```

# What's the BIG deal?

- No human in the loop.
- Policy authored against logical instances in Service Definition.
- Automatic management!
  - Service growth,
  - Evolution,
  - Operation.

# The BIG Architecture

## Service Definitions



## BIG Management Service

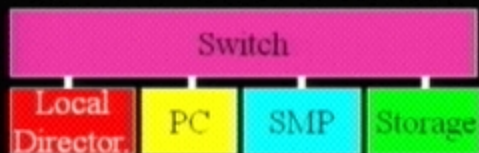
Service Definition Object Model

Coordination Primitives

Instance State Tracking

Physical Resource Manager

## Hardware Definitions



## Drivers



# The BIG Deal!

- The BMonitor:
  - Enable single-node management,
  - Facilitates rapid image deployments.
- The Service Definition Model:
  - Defines a namespace for deployment and management.
  - Captures scale-invariant attributes of services.
- The BIG Management Service:
  - Provides operating environment for management and operations code.
  - Tracks state w/ introspection on model and instances.
  - Wraps non-PC hardware in device drivers.



# Project Status Overview

- Goals for Version 1
- Status Summary
  - Drill down on details as desired / needed
- Action Items

# Version 1 Goals

- Hand off system-level work to NT Team
  - BMonitor
  - Installation support
- Service definition and infrastructure that supports:
  - Hotmail
  - At least one other MSN property
  - Perhaps MS Exchange server management (with partitioning?)

# Status Summary

- BMonitor runs on single chipset / NIC
  - Investigating NT Kernel-based code
  - Move to PXE supported boot scenarios
    - Strong interest from several groups in MS
    - Hold offsite in Dec – Jan timeframe to nail requirements
  - Hand off to NT Kernel team
- Installation
  - Images built by hand, requires 1 image per component
    - Needs 2 boots with SysPrep for SID's
  - Hand off to NT Setup & Kernel teams
    - Collaborate on requirements with all interested parties



# Status Summary (cont'd)

- Device Support
  - BMonitor for computers
    - Rely on NT for broad NIC, disk & chipset support
    - Extend health & monitoring functionality
  - Cisco LD
    - First cut, needs work (BIG team)
  - Additional devices needed
    - Switches
    - Other routers
    - Network storage (e.g. EMC)



# Status Summary (cont'd)

- API's & Protocols
  - BMCP, Namespace queries
  - Still in flux as design converges
    - What are required (kernel-level) vs. additional services?
    - Group Membership protocols
      - Talking to Blaing about Berman's Cornell code
    - Nested policy
    - Compound components
    - Naming issues

## Status Summary (cont'd)

- Still at design stage
  - Service definition model
  - Resource management, Sharing & Physical model
  - Reusable Policy & Components
  - Reliability / QoS
  - Orthogonal management

# Action Items

- NT Team
  - Take over BMonitor development
    - Support PXE boot
    - Multicast support for scalability
      - MTFTP for PXE
      - FCast or ? for NT images
    - Features from BIG, Apps/Data Center, SMS...
  - Installation tools
    - Create and manage images
      - Base Image + apps + patches
    - Naked & repurposed machine scenarios



## Action Items (cont'd)

- BIG team
  - Host NT Deployment/Repurposing offsite
  - Finish design work
    - Requirements driven by Apps/Data Center, MSN, etc.
    - Implement and test
  - Work with NT team on BMonitor & Install req's
  - Manage scaled versions of services
    - Hotmail
    - At least one other MSN service
    - ITG Exchange Server farm ?







BlopClt

```

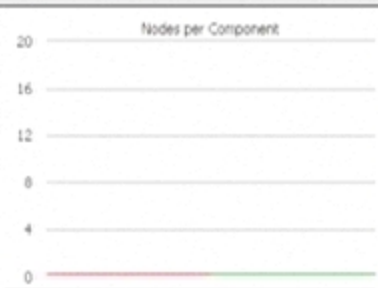
10.5.0.5: IRRS Policy: new Product DB at 10.3.0.28.
10.5.0.5: IRRS Policy: new Product DB at 10.3.0.29.
10.3.0.16: IRRS FE: I'm up.
10.3.0.16: IRRS FE: I'm ready!
10.5.0.5: Cisco LD Proxy: adding FE (10.3.0.16) to load balancing group.
10.3.0.14: IRRS FE: I'm up.
10.3.0.15: IRRS FE: I'm up.
10.3.0.17: IRRS FE: I'm up.
10.3.0.17: IRRS FE: I'm ready!
10.3.0.14: IRRS FE: I'm ready!
10.5.0.5: Cisco LD Proxy: adding FE (10.3.0.17) to load balancing group.
10.5.0.5: Cisco LD Proxy: adding FE (10.3.0.14) to load balancing group.
10.3.0.28: IRRS Prod DB: I'm up.
10.3.0.28: IRRS Prod DB: Connected to the BIG runtime.
10.3.0.28: IRRS Prod DB: Registered IDSs SAP [17].
10.3.0.15: IRRS FE: I'm ready!
10.5.0.5: Cisco LD Proxy: adding FE (10.3.0.15) to load balancing group.
10.3.0.28: IRRS Prod DB: IDSs SAP attached to a wire [17].
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10.5.0.5: IRRS Policy: CPU overload on Front End at 10.3.0.15.
10.5.0.5: IRRS Policy: new Front End at 10.3.0.18.
10.5.0.5: IRRS Pol

```



Nodes per Component

Console Window Help



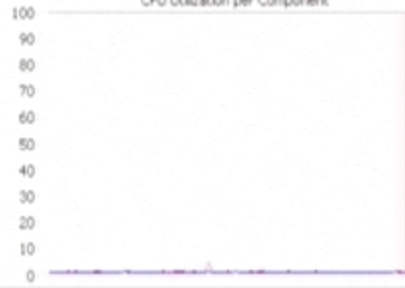
Color Counter Instance

# of IRRS Front Ends

Win 10000 Peak at 70.0

big-quad2 - Terminal Services Client (Big-Quad2)

CPU Utilization per Component



Color Counter Computer

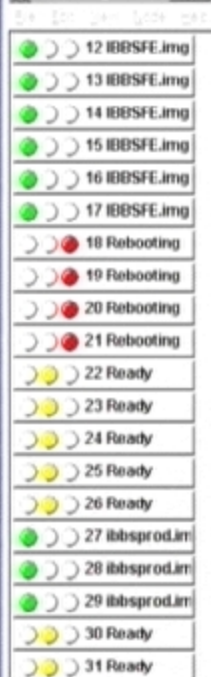
% Processor Time

\\10.3.0.12

Win 10000 Peak at 70.0

Win 10000 Peak at 70.0

BIG: Debug Cons...



```

11:46:39 DHCP: ...
11:47:03 DHCP: ...
11:47:03 DHCP: ...
11:47:04 DHCP: ...
11:47:04 DHCP: ...

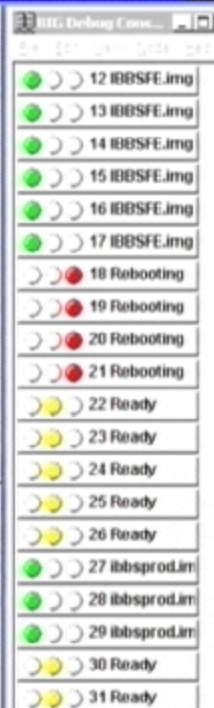
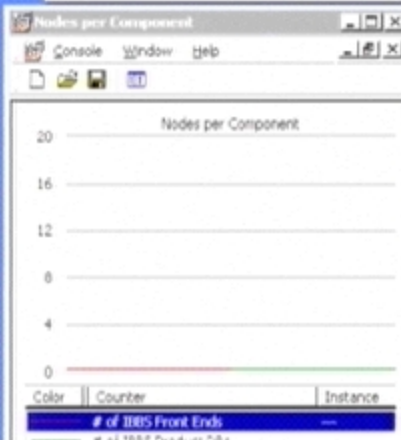
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BlogClient
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10.5.0.5: IRRS Policy: new Front End at 10.3.0.19.
10.5.0.5: IRRS Policy: new Front End at 10.3.0.20.
10.5.0.5: IRRS Policy: new Front End at 10.3.0.21.

```



```

11:46:39 DRICP: ...
11:47:03 DRICP: ...
11:47:03 DRICP: ...
11:47:04 DRICP: ...
11:47:04 DRICP: ...

```

My Documents Enterprise Manager

My Computer Query Analyzer

My Network Places NEWS SDK Overview

Recycle Bin Policy Demo

Internet Explorer Shortcut to explorer

Shortcut to BigUI.vst BlogClient

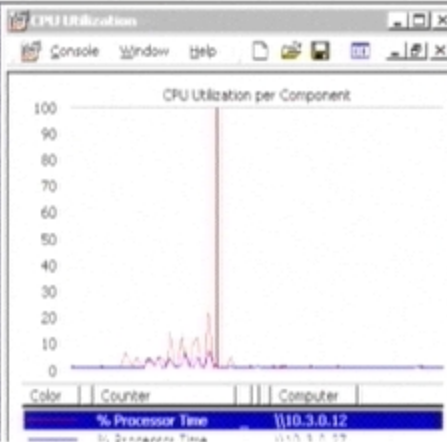
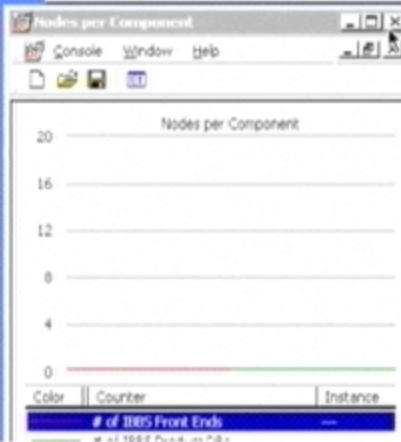
Shortcut to bbs.msc BIG

PK bbs

IMAGED Profiler

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10.3.0.17: IIBS FE: I'm up.
10.3.0.17: IIBS FE: I'm ready!
10.3.0.14: IIBS FE: I'm ready!
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10.5.0.5: IIBS Policy: new Front End at 10.3.0.20.
10.5.0.5: IIBS Policy: new Front End at 10.3.0.21.
10.5.0.5: IIBS Policy: CPU overload on Front End at 10.3.0.17.
10.5.0.5: IIBS Policy: new Front End at 10.3.0.22.
10.5.0.5: IIBS Policy: new Front End at 10.3.0.23.
10.5.0.5: IIBS Policy: new Front End at 10.3.0.24.
10.5.0.5: IIBS Policy: new Front End at 10.3.0.25.
10.5.0.5: IIBS Policy: CPU overload on Front End at 10.3.0.14.
10.5.0.5: IIBS Policy: new Front End at 10.3.0.26.
    
```



12 IIBSFE.img

13 IIBSFE.img

14 IIBSFE.img

15 IIBSFE.img

16 IIBSFE.img

17 IIBSFE.img

18 Rebooting

19 IIBSFE.img

20 IIBSFE.img

21 Rebooting

22 Rebooting

23 Rebooting

24 Rebooting

25 Rebooting

26 Rebooting

27 ibbsprod.in

28 ibbsprod.in

29 ibbsprod.in

30 Ready

31 Ready

```

11:47:04 DRICP: ...
11:54:28 DRICP: ...
11:54:28 DRICP: ...
11:54:28 DRICP: ...
11:54:28 DRICP: ...
    
```



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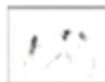
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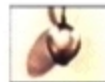
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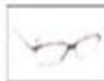
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